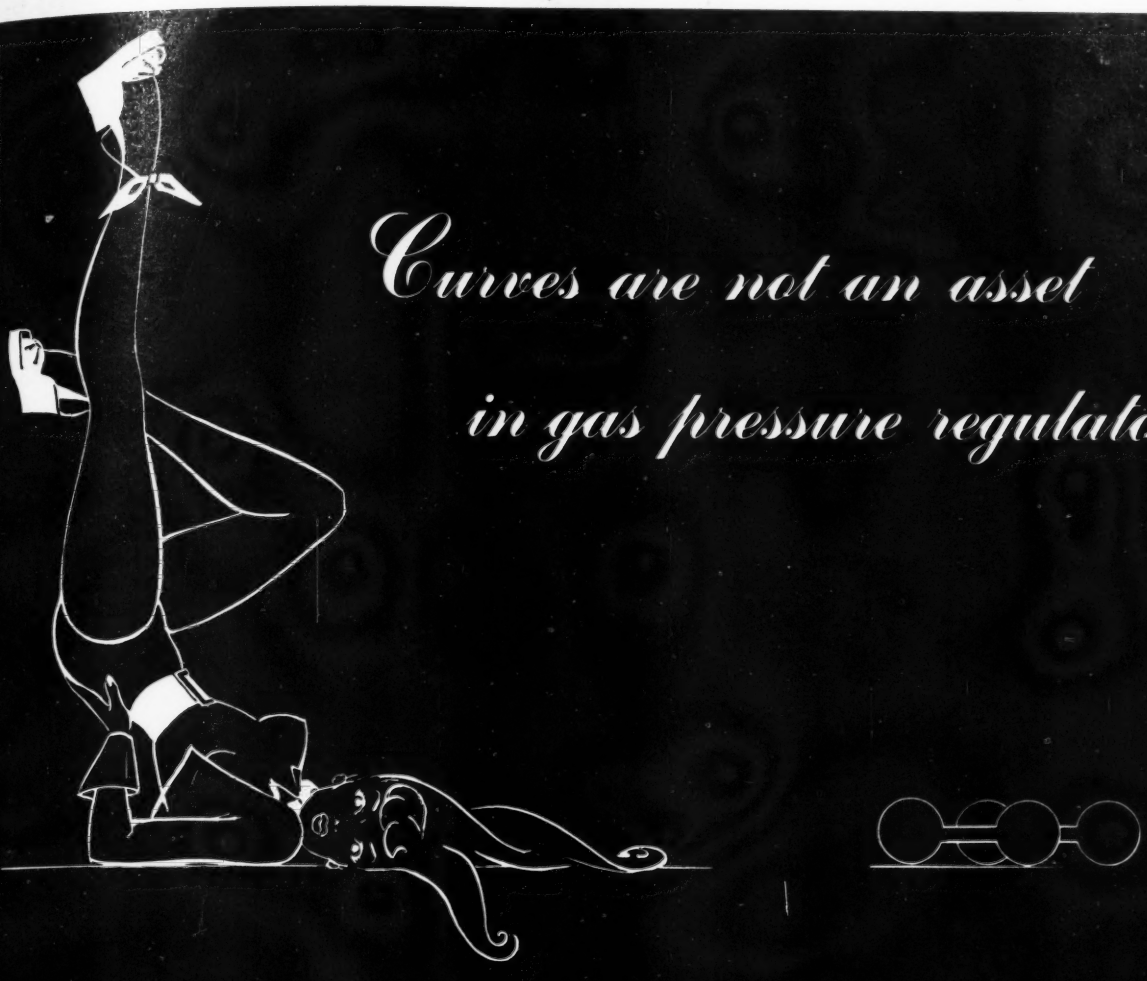

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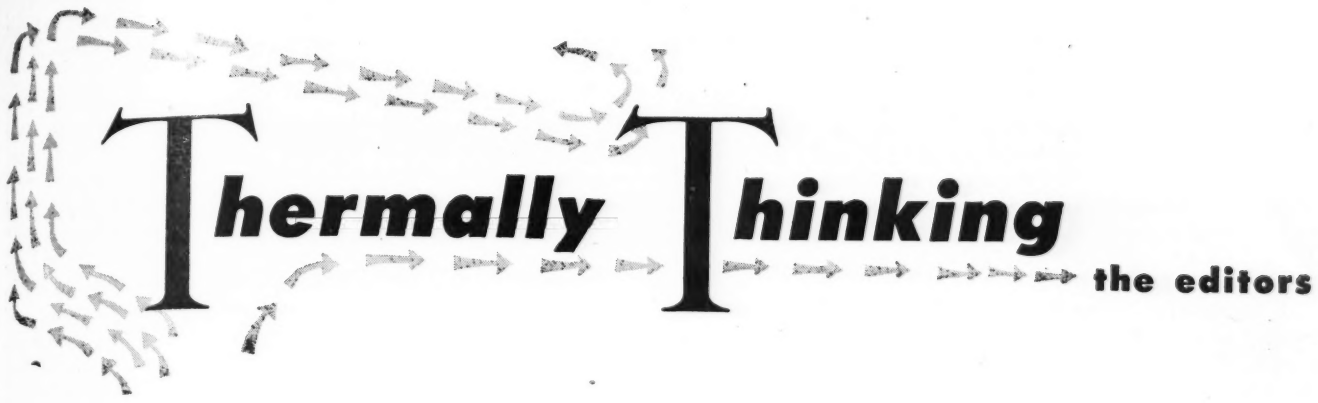
As AGA vice president and top natural gasman for 1950, C. E. Bennett will preside at the Natural Gas Department's spring meeting in Dallas, May 7-8 (page 29).



Surcease on Taxes

THE GAS INDUSTRY can heave a sigh of relief on one score. Word seeping out of the House Ways and Means Committee, considering new tax legislation, is that no proposal will be made by the committee to cut the present 27½% gas and oil depletion allowance.

Members believe that the administration's request for a cutback to 15%, in order to "close loopholes," is another attempt by the administration to take advantage of the emergency to put over a long-standing desire by some tax officials. The request for lowering the depletion allowance has been made several times before, now is almost a spring perennial around Washington.

Incidentally, the next tax legislation—and it will come very late in the year, *if* it comes at all this year, which is still a question—in all likelihood will retain the special provisions for regulated public utilities in computing their excess profits tax liabilities. A few organized labor spokesmen so far are the only ones around here who have criticized these provisions, inserted in the recent tax bill passed by the dying 81st Congress.

New "Kerr" Bills

NEW LEGISLATION to exempt independent producers and gatherers of natural gas, as well as "incidental transportation" by any producer or gatherer—a counterpart of the controversial Kerr bill of last year—has been dropped into the House of Representatives' hopper by Congressman John E. Lyle Jr. (D.-Texas), but so far has not been introduced in the Senate. One of its ardent supporters in the "upper body" seems to be Sen. Herbert R. O'Conor (D.-Md.), who has urged amendments to the Natural Gas Act which would exempt local gas distributors from federal regulation.

In a little-noticed Senate speech, Senator O'Conor said that he and Sen. John Bricker (R.-Ohio) would introduce amendments to avoid the "evils of over-centralization" of federal powers and to clarify recent court rulings on the act. The amendments would exempt from federal control distributors receiving gas from interstate pipelines, but selling it in only one state.

It is not clear yet whether or not the pro-Kerr forces will press for action in the Senate or House of Representatives on the equivalent of the old Kerr bill. Perhaps these statements and the introduction of the legislation by Representative Lyle merely are moves designed to warn the Federal Power Commission, which had begun hearings on the Phillips Petroleum Co. case, to go slow, or, in fact, to keep "hands off."

Fuel Policy Chances Slim

WHILE A "REPORT"—with some "recommendations"—undoubtedly will be made by the Senate Committee on Interior and Insular Affairs before the deadline (June 30), it is considered extremely unlikely in well-informed Washington circles that any specific legislation looking toward a "national fuel policy" will be introduced as a result of the months-long inquiry made at the instigation of former Sen. Francis J. Myers (D.-Pa.), who lost out in the past elections.

Virtually all of the significant discussion at the recent "round table" conferences held by the committee as part of its studies revolved around the proposal to compel the use of coal (by industry) to conserve gas and oil. Coal interests would like to see some kind of restriction put on end use of natural gas, but even they doubt that they can push through legislation which would allow the executive branch to do this in the Congress as presently constituted.

The legislation designed to bring forth a similar study looking toward a "national fuel policy," introduced in the House of Representatives by Congressman John E. Heselton (R.-Mass.) and referred to the House Committee on Rules, likely won't get to first base.

Battle in Bartlesville

WORD FROM BARTLESVILLE, OKLA., where the Federal Power Commission after some 2½ years of maneuvering began hearings on the rate case of the Phillips Petroleum Co. is to the effect that FPC has been challenged by Phillips to show that it has authority over the rates for natural gas which Phillips charges the distributing companies it serves.

It will be recalled that complaints from the State of Wisconsin and the City of Detroit back in early '48 caused the FPC to issue its original order of investigation on Nov. 3, 1948. After many delays, the FPC last December tentatively approved Phillips' request for a postponement for the "duration" of the national emergency. Subsequently, the FPC changed its collective mind and ordered the investigation which began in Bartlesville.

Sen. Alexander Wiley (R.-Wis.), whose consumer-constituents in Wisconsin can be assumed to be interested in the case, has written to FPC Chairman Mon Wallgren, sharply criticizing the agency for dilly-dallying and the company for its "devious strategy" in prolonging the case.

"I do not want to prejudge a case or to be unfair, but it seems to me that the Federal Power Commission has throughout this whole case not behaved in a manner that would inspire the confidence of the consumers of Wisconsin," Senator Wiley wrote. "On the contrary, it would appear, at least on the basis of evidence available to me thus far, that the commission has carried out its policies in a most questionable manner; that it does not evidence any keen desire to protect the average man from some apparently unscrupulous interests which appear to be more concerned about exorbitant profits than they are about service to the public."

Specifically, Phillips is charged with having set excessive prices to the Michigan-Wisconsin Pipe Line Co., which serves Missouri, Iowa, Wisconsin, and Michigan. The company obviously is maneuvering for a court test case of FPC's authority. Virtually all other gas companies will be watching the outcome of the maneuvering with interest, as will the Congressmen from the "oil and gas states" in the national legislature, and many from the big-city districts in which so many gas consumers reside.

Wellhead Price Fix Faces Test

FEDERAL POWER COMMISSION by now likely has had to challenge the right of a state to fix a minimum price for gas, whether it wished to do so or not. The decision probably was forced on FPC, unless some kind of "out" has been conjured up, by the Northern Natural Gas Co., which presented evidence for a requested rate increase totalling $9.2 million, using as a key exhibit a ruling by the Kansas Corporation Commission that the minimum price of 8 cents per 1000 cu ft must be "attributed" to all gas taken from the Kansas part of the Hugoton gas field.

Almost a dozen companies, distributing Northern's gas, questioned its figures on the cost of gas produced by the company in Kansas. FPC counsel objected to the consideration of any other evidence of gas cost except the actual cost to the utility, after an FPC examiner disallowed the evidence of the state-fixed minimum rate. Northern Natural took exception to that disallowance, insisting that the FPC rule (by acquiescence or otherwise) on whether it approved or disapproved the examiner's ruling.

Since the U. S. Supreme Court has confirmed the authority of the Kansas commission in two separate cases to fix the minimum wellhead price of gas produced in that state, the FPC must distinguish between recognition of state minimum prices for gas and gas actually produced at a different cost by a pipeline company exporting the gas for sale in interstate commerce.

The various distributing companies maintain that Northern Natural actually produced its gas for less than 8 cents per Mcf and argued that the FPC should take into consideration only actual costs. However, Northern produces only a portion of its supply and buys the remainder from other producers. The question naturally arose as to whether FPC has the power to qualify minimum prices set by a producing state without specific legislation to that effect from Congress, in view of the Supreme Court's recent clear rulings to the contrary.

Is This Line Really Necessary?

BRUCE K. BROWN, deputy administrator of the Petroleum Administration for Defense, speaking in Beaumont, Texas, before the Texas Independent Producers and Royalty Owners Assn., stated plainly that "the materials situation (for oil and gas tubular and other goods) is bound to get worse before it gets better."

This bears out the belief of Washington observers who have heard of the declining production of steel pipe available for both oil and gas lines. Reports are to the effect that the decline in current production of such pipe is running as much as 40% under production of a year ago.

"The basic difficulty, of course, arises from the fact that we are trying to meet rising military requirements without making such drastic cutbacks in the civilian economy as we found necessary during World War II," Mr. Brown continued. "In doing so, we are running up against the painful fact that there aren't enough basic materials to go around."

Mr. Brown said that to prevent further slippage of line-pipe output, PAD has urged the National Production Authority to freeze production at or about the current rate. And since the production rate already is substantially below the level needed to meet realistic gas requirements, he added, the agency is asking NPA to work with PAD in setting up procedures later for scheduling line-pipe deliveries for gas operations based on the relative essentiality of each project.

Explaining how PAD is organizing to handle the governmental end of the mobilization job in the oil and gas industries, Mr. Brown declared:

"One of our first objectives was to organize an effective Materials Division to determine the materials needs of these industries and to press PAD's claims on behalf of the industries before the NPA . . ."

He deprecated the manpower shortage, to a degree, expressing his hope and belief that it will not get worse, but may ease after a period.

Almost simultaneously with Mr. Brown's speech, Secretary of the Interior Oscar L. Chapman released a list of the top personnel to serve in the Materials Division of PAD, plus the "organizational framework" of that division.

At the same time, Secretary Chapman announced that, although formal priorities assistance authorized under NPA Order M-46 is now limited to MRO materials (maintenance, repair, and operating supplies) and oil-country tubular goods (steel case, tubing, and drill pipe), PAD's Materials Division is prepared to give informal assistance, in urgent cases, to members of the oil and gas industries in obtaining materials, equipment, or supplies needed for other purposes.

Secretary Chapman emphasized, however, that before applying to PAD for assistance, operators should exhaust every other means of expediting delivery of needed materials.

Individuals or firms in urgent need of assistance should address letters or telegrams giving full particulars to Frank A. Watts, director, Materials Division, PAD, Washington 25, D.C., or in emergencies should telephone chiefs of branches dealing with the particular items involved.

FPC to Stay Put

INCIDENTALLY, don't think any more about the idea Mon Wallgren, FPC chairman, had some months ago of removing the agency to the mountains of Colorado, or some other place far from potential atom-bombing.

This idea didn't catch on so well at the White House and Mr. Wallgren is not as close as he once was to the President, who is bothered with so many "big" decisions he hardly ever thinks of FPC or other agencies similar to it any more, except to express his hope that the administrators will keep out of trouble.

But the folks who really frowned on the Wallgren idea were in General Services Administration, which has brought forth a dispersal program, at Presidential direction. FPC is not mentioned. The GSA dispersal program would not move any agency more than 30 miles from the District of Columbia, although some agencies long since slated for decentralization would be moved to other centers far removed from the nation's capital. But these are peace-time agencies pure and simple, and have been talking about decentralizing for economy reasons for years.

Technical Trends

guy corfield

Interchangeability Again

INTERCHANGEABILITY continues to be one of the most important and perplexing problems of gas utilization. Its technical aspects and application are being progressively explored and better understood. However, with the advance of natural gas into new regions, to be distributed either "straight" or "mixed," and with "standby" gases held in readiness for emergency or peak load, a variety of problems continues to confront the utilization engineer who endeavors to keep appliances functioning satisfactorily at all times. These problems are concerned largely with forecasting, by calculation if possible, the performance of appliances on a variety of gases without readjustment, or the necessary adjustment when changing from one gas to another.

An important new contribution to the literature and technique of interchangeability calculations has just been presented in the Journal of Research of the National Bureau of Standards, Volume 46, No. 3, March 1951, entitled "Formulas and Graphs for Representing the Interchangeability of Fuel Gases," by Dr. Elmer R. Weaver. It is identified as Research Paper 2193, and can be obtained at a cost of 25 cents from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

In this extensive research paper the author shows the derivation and application of six "indexes" for "specifying and predicting from the composition of any two fuel gases the extent of the effects that occur when one is substituted for another (in gas burning appliances)." The data are based mainly on experiments conducted at the AGA Laboratories and reported in Bulletin 36 and the several sections of Report 1106.

Dr. Weaver's indexes have designations, and relation to phases of performance, as follows:

J_A—Index for Air Supply—is zero when total quantity of air required to burn each gas is equal, and amount injected as primary air is equal.

J_F—Index for Flashback—is zero when gases are exactly interchangeable.

J_H—Index for Rate of Heat Production—is one when gases are exactly interchangeable.

J_I—Index for Incomplete Combustion—is zero when gases are exactly interchangeable.

J_L—Index for Lifting—is one when gases are exactly interchangeable.

J_Y—Index for Yellow Tips—is zero when gases are exactly interchangeable.

The author discusses these indexes in comparison with those previously developed, particularly in AGA Laboratories Bulletin 36, "Interchangeability of Other Gases with Natural Gases." It will be recalled that the AGA indexes were:

I_F—Index for Flashback.
I_L—Index for Lifting.
I_Y—Index for Yellow Tips.

It is asserted that extensive comparisons of the indexes JL, JF, JY and JI with the results of experimental studies made by the AGA show them to give a somewhat closer representation of the observations than any other method that has been proposed.

We're 25 Years Ahead

THE GAS INDUSTRY is frequently accused of being slow, out-of-date, and non-progressive as compared to the assertedly active, up-to-date, and progressive electric industry. Regardless of whether this overall comparison is true or false, nevertheless there does seem to be one phase in which the gas industry has taken a 25-year lead over its competitor.

It was recently announced through various media, including an article in the February 1951 issue of *Standardization*, the monthly publication of the American Standards Assn., titled "Making Home Ranges and Water Heaters Safe and Efficient," that the National Electrical Manufacturers Assn. has developed, approved, and obtained adoption of American Standards on "Household Electric Ranges" and "Household Automatic Electric Storage-Type Water Heaters." It is stated that these standards were "prepared by representatives of public electric service companies, manufacturers, home economists, safety organizations, commercial laboratories and government departments" and "offer a criterion by which the user or the retailer can judge whether the stove or water heater he buys will function properly and will do the job he wants it to do and do it safely."

Gas industry people will of course immediately recall that our American Gas Assn. Laboratories and approval requirements organization were started in 1925, and a check reveals that the first gas range requirements were released in 1926, the first gas water heater requirements in 1927. These first requirements and their early modifications did not become American Standards until 1933 because it was not until then that such arrangement was made with the ASA. However, they were at all stages national in scope and embodied the best technical and economic thinking of the gas utilities and gas appliance manufacturers and highest national agencies representing government, safety, fire prevention, home economics, etc. It can therefore be stated with pride that the gas industry has been voluntarily operating for 25 years under uniform national appliance standards of safety, durability, efficiency, and serviceability that the electric industry has only recently seen fit to inaugurate.

An examination of these electric appliance standards indicates that they are not entirely as specific or definite as the corresponding gas appliance requirements. In some cases definite degrees of performance are stipulated, and methods of test are outlined which will indicate whether the degree of performance is attained; in other cases, however, such as stiffness of an open oven door as load is applied at one outer corner when the other corner is rigidly supported, a test procedure is given including instruction to measure and report the deflection of the free corner, but it is not stated how great a deflection is considered unsatisfactory.

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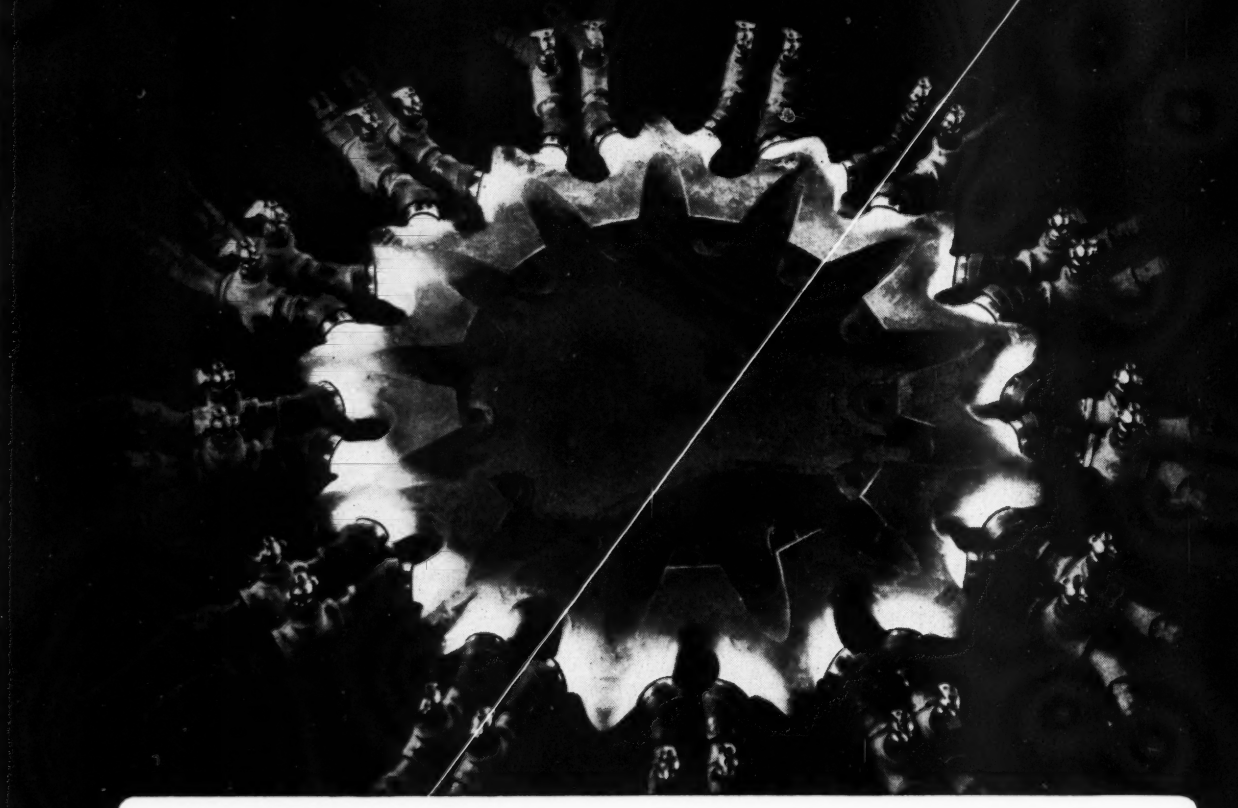

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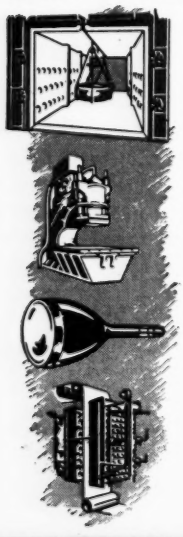

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This precision tool utilizes radiant heat . . . combines high temperatures, automatic operation, precise controllability and protective atmospheres.

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MOBILIZATION FOR DEFENSE

SHIFTING emphasis in executive thinking toward matters of defense will inject a new tone into the AGA Natural Gas Department spring meeting when it convenes May 7-8 at the Adolphus Hotel in Dallas.

The first spring meeting since the Korean affair began, its program has deviated from the usual pattern to throw the spotlight on a relatively new concept, one that has a current importance unrecognized in past experience—the relationship of natural gas to defense.

The problems raised and the opportunities offered are truly unparalleled. An industry that was to a large extent a local affair before World War II has grown to amazing stature. It has new opportunities, and new obligations. Should full-scale war come, it will have a real job to do.

Three events on the program tie more or less directly into this new theme, and one of these promises to sound the keynote of the industry's outlook for the new era. Paul Kayser, president of El Paso Natural Gas Co., Houston, is the speaker.

Mr. Kayser's subject, "Natural Gas in Relation to Defense," carries a title identical to an address he gave before the American Petroleum Institute's division of production in Amarillo, Texas, late in March.

On that occasion, he said:

"In appraising any commodity in relation to the national defense program, two things must be borne in mind:

1. To what extent does the commodity contribute to the production of munitions and other war materials and to the actual training of troops; and

2. To what extent is it necessary for the maintenance of the economy at a high productive level.

"Natural gas fulfills both of the requirements."

To substantiate, he cited these facts:

Natural gas supplies the fuel for the production of 95% of the potash (an important ingredient in the manufacture of explosives) produced in this country.

More than 50 per cent of the nation's chemical plants are located along the gulf coast and are fueled with natural gas.

In steel making, natural gas is essential in certain heat-treating processes.

Gas is used to process aluminum in Tennessee plants, and a new plant located in Corpus Christi, Texas, is powered with 50 MMcf per day of natural gas.

Natural gas is the fuel used in the majority of troop training camps, located throughout the Southwest and Far West.

Would a new war merely be a second run on World War II's operating methods and conditions?

C. E. BENNETT
Presiding Officer

Indeed not, he pointed out. At the beginning of that war, in 1941, natural gas contributed only 11.1% of the energy consumed in the period. In 1949, it contributed 18.7%, a 70% increase—and in 1951 the figure would be closer to 22%.

In 1941, total utility sales of natural gas were 1569 billion. In 1949 they were 3107 billion.*

National defense demands efficiency. Natural gas is an efficient fuel, said Mr. Kayser.

"By taking present freight rates for coal and present costs of transporting natural gas (and oil) through large diameter, high-pressure pipelines, it can be demonstrated . . . that the transportation of a unit of energy, a kilowatt hour, by means of coal is the most inefficient method of transportation of such a unit of energy, and that (next to the transport of oil) the most efficient method . . . is by the transportation of 1000-Btu natural gas by high-pressure, large-diameter pipeline."

Should the jumping demand for natural gas hasten its depletion, the nation would have, as a result of the past five years' pipeline construction, a highly efficient network of lines which could carry gas made from coal and oil shales. "Technology for the construction and operation of synthetic plants has already progressed to the point that competent engineers tell us that . . . 900-Btu gas can be made from coal and oil shales," he declared.

Mr. Kayser is expected to cover similar ground in his address at the natural gas meeting.

A second item of consummate interest to natural gasmen at this time is the steel situation. Not only in times of national defense, but always, the relationship of gas to steel is a vital, two-way affair. Gas helps to make steel, and steel is needed in the expanding net-

*In 1950, utility sales were estimated at 3694 billion.

work of pipelines that transport gas. But in view of the materials situation, the evaluation of "The Steel Situation" by John E. Goble, president of National Tube Co., Pittsburgh, will have unusual interest and importance at this time.

Third in the lineup of defense papers is the presentation, "Mobilization for Defense," by Bruce K. Brown, deputy administrator of the Petroleum Administration for Defense.

Yet another facet of the natural gas role in defense is the conservation picture. Is use of the gas in itself a waste? Should we save it for future generations or should we continue to use it wisely and depend on the results of research to solve the day after tomorrow's fuel needs?

Olin Culberson, chairman of the Texas Railroad Commission, will speak on this subject.

Conservation, however, might be considered in the broader aspects of the relationship of the several fuels in the defense structure. Consider the case of oil, for example.

According to C. H. Gueffroy, president of the Portland (Ore.) Gas & Coke Co., addressing a recent meeting of the Bonneville Regional Advisory Council in Portland, "an adequate supply of natural gas (in the Pacific Northwest) in a few years would save the use of approximately 12 million barrels of oil per year now consumed in this region. To make possible such a saving of this valuable resource would constitute an outstanding contribution to the future of our national security."

Such thoughts as these will be on the minds of gasmen as they gather for discussions in Dallas.

Regulation and legislation—which is the title of an address scheduled to be given by Frank H. Lerch Jr., president of Consolidated Natural Gas Co., New York—are also assuming a defense character. Congress has been shaping up a national fuel policy which may become the law of the land. "We're running out of gas" and "You're wrecking the economy by displacing coal" are two war cries of the coal industry that may find official voice in such legislation. The gas industry's fight to prevent the final acceptance of such a policy has been long and bitter.

Research is bringing natural gas to a high peak of efficiency. Elmer F. Schmidt, chairman of the technical and research committee of the AGA and vice president of the Lone Star Gas Co., Dallas, will describe this work.

* * *

Aside from problems in the realm of management, operating methods will receive the usual attention of the more than 1000 delegates expected to attend. Two sessions are planned, and the three most vital aspects of the business in 1950—underground storage, gas turbine centrifugal compressors, and communications—will be covered. A. A. Cullman will explain gas storage accounting. His company, Columbia Engineering Corp., affiliate of the Columbia Gas System, is one of the pioneers in storage work. H. A. Rhodes, superintendent of communications for Transcontinental Gas Pipe Line Corp., will discuss modern communications. Transco has been installing a microwave, most modern mode of communications, along its 1800-mile Texas-to-New York line.

J. F. Eichelmann of El Paso Natural and J. S. Quill of General Electric Co., Schenectady, N. Y., will cover the assignment on gas turbine centrifugal compression.

Pulsation dampeners in meter station operations will be examined by J.S. Bailey, Continental Oil Co., Ponca City, Okla.; in compressor stations, by a representative of the Fluor Corp.

Two movies are scheduled—one on construction of Pacific Gas & Electric Co.'s "Super Inch" line from the Colorado river to San Francisco, the other on the "Transcontinental Story."

C. E. Bennett, vice president of the AGA and head of the department, will preside. D. A. Hulcy, AGA president and head of the host gas company, Lone Star, will report on the association.

Program for AGA Natural Gas Spring Meeting
Dallas, May 7-8

GENERAL SESSIONS

Presiding: C. E. Bennett

MONDAY, MAY 7, 10 A.M.

WELCOME TO DALLAS
Mayor of Dallas

THE ASSOCIATION AND THE INDUSTRY
D. A. Hulcy, president
American Gas Assn.
President, Lone Star Gas Co., Dallas

THE STEEL SITUATION
John E. Goble, president
National Tube Co.
Pittsburgh

REGULATION AND LEGISLATION FROM MANAGEMENT'S VIEWPOINT
Frank H. Lerch Jr., president
Consolidated Natural Gas Co.
New York

RESEARCH DEVELOPMENTS
E. F. Schmidt, chairman
Technical and Research Committee
Vice President, Lone Star Gas Co., Dallas

TUESDAY, MAY 8, 10 A.M.

NATURAL GAS CONSERVATION
Olin Culberson, chairman
Railroad Commission of Texas
Austin

MOBILIZATION FOR DEFENSE
Bruce K. Brown, Deputy Administrator
Washington, D.C.

NATURAL GAS IN RELATION TO NATIONAL DEFENSE
Paul Kayser, president
El Paso Natural Gas Co.,
Houston

MOTION PICTURE
"Construction of the 500-mile, 34-in. Transmission Line from Topock on Arizona - California Border to Milpitas on San Francisco Bay"
Introduced by
James S. Moulton, vice president
Pacific Gas & Electric Co.,
San Francisco

TRANSMISSION COMMITTEE

Open Meeting
Presiding: M. V. Burlingame

MONDAY, MAY 7, 2 P.M.

FEATURES OF A GAS TURBINE CENTRIFUGAL COMPRESSOR STATION FOR GAS PIPELINE PUMPING
J. F. Eichelmann
El Paso Natural Gas Co.
and
J. S. Quill
General Electric Co.,
Schenectady, N.Y.

PULSATION DAMPENERS
RESULTS AS APPLIED TO METER STATION OPERATIONS
J. S. Bailey
Continental Oil Co.
Ponca City, Okla.
RESULTS AS APPLIED TO COMPRESSOR STATION OPERATION
Prepared by the
Fluor Corp.,
Chicago

TUESDAY, MAY 8, 2 P.M.

A PROVEN APPROACH TO PIPELINE RIGHT-OF-WAY MAINTENANCE
Arthur W. Emerson
U. S. Soil Conservation Service
U. S. Department of Agriculture
Lincoln, Neb.

MODERN COMMUNICATIONS, THE NERVE CENTER OF PIPELINE SYSTEMS
H. A. Rhodes, Supt. of Communications
Transcontinental Gas Pipe Line Corp.,
Houston

SOME OPERATING ASPECTS OF GAS STORAGE ACCOUNTING
A. A. Cullman, chairman
AGA Accounting Section
Assistant Treasurer
Columbia Engineering Corp.,
New York

"TRANSCONTINENTAL STORY"
Motion picture showing construction of the Texas to New York natural gas pipeline—sponsored by Transcontinental Gas Pipe Line Corp.

63 MAJOR GAS COMPANIES WILL SPEND $254,490,975

The majority of expenditures in 1951 construction budgets will be for extensions and improvements in natural gas systems. In addition to the 13,643 miles that pipeline companies will lay this year (see "Progress on the Pipeline: 1951, p. 95), distributors will construct 849 miles of transmission line and 3838 miles of distribution mains.

ARKANSAS-LOUISIANA GAS CO., Shreveport, will spend $8,037,000 as this year's portion of a 1949-54, $15 million program. Of the 1951 expenditure, $1,445,000 will be allocated to production for gas well drilling, $4,089,000 will be spent on transmission to increase Buckley compressor station to 7000 hp, and $2,293,000 will be used for distribution, mainly in extending service to three additional Arkansas towns — Lonoke, Hummoke and Thornton. Another $210,000 has been allotted to miscellaneous. This year 112 miles of transmission line and 133 miles of distribution mains will be laid. By 1954, an additional 167 MMcf per day with 274 MMcf per day for peaks will be available.

The Bridgeport (Conn.) Gas Light Co. is converting to natural gas by early fall at an estimated cost of $830,000. Its plant will be adapted to use of gas oil with four carburetted water gas sets to be changed over. During the first five years of operation it is estimated $131,000 will be spent for production plant capital items and $2.3 million will be invested in the distribution system.

Brooklyn Union Gas Co. has allotted $4,640,000 as its 1951 budget. In January, when the company received natural gas, its sendout gas was changed from manufactured to a mixture of reformed natural, natural, coke oven, and carburetted water gas with a heating value of 540 Btu. The current budget includes $2,080,000 for distribution, including mains, meters, and services; $200,000 for plant construction, and $1,360,000 for transmission, covering mains, governors, etc. Another $1 million will be spent on installation of sectionalization valves, mains, and regulators in connection with conversion to 1000-Btu gas planned for 1952. Approximately two miles of transmission line and 16 miles of distribution mains will be laid.

Central Arizona Light & Power Co., Phoenix, has allocated $1,987,000 as this year's portion of a long range program for expanding its distribution system. The firm is adding six miles of 6-in. main to supply additional gas to Luke Field air base, two miles of 10-in. to supply more gas to northern Phoenix and Sunnyslope, and about 160 miles of distribution mains to serve 8000 new customers.

Central Electric & Gas Co., Lincoln, Neb., is spending $2,265,000 this year on new main extensions, replacement of smaller sized mains, replacement of feeders, installation of a propane air peak shaving plant, and new distribution systems in nine towns. This program will increase capacity by 13 MMcf of natural gas per day for firm service; 12 MMcf for peaks. New cities to be served include Norfolk, Stanton, Madison, Newman Grove, Battle Creek, Humphrey, Lindsay, Meadow Grove, and Tilden, Neb.

Central Hudson Gas & Electric Corp., Poughkeepsie, is spending $376,000—$66,000 for production and transmission, $180,000 for new business, $100,000 for distribution, $20,000 for meters and governors, and $10,000 allocated to miscellaneous.

Central Illinois Public Service Co., Springfield, will spend $1.5 million on a long range program of expansion which started in 1949 and will be completed in 1955. The current budget is $502,000, with transmission being allotted $256,000. Of this, $158,000 will be spent on a 400-hp compressor and three miles of 10-in. line, $85,000 for relocating of 14 miles of 6-in., and $13,000 for miscellaneous regulator and meter stations. Distribution will receive $246,000 — $27,000 for converting areas from low to intermediate pressure, $29,000 for booster mains, $20,000 for distribution mains, and $140,000 for miscellaneous replacements and additions. Fifteen miles of distribution mains will be laid. For firm service 3.5 MMcf per day additional sendout will be provided, with 10 MMcf for peaks.

Cheyenne (Wyo.) Light Fuel & Power Co. is spending $117,800 on distribution—making routine extensions and laying approximately seven miles of distribution mains.

Cincinnati Gas & Electric Co. and its subsidiary, Union Light, Heat & Power Co., have budgeted $5,136,000 to be spent for general expansion, including 4½ miles of additional transmission lines and 16 miles of distribution mains. The budget will be broken down into $438,000 for production, $1,555,000 for transmission, $3,132,000 for distribution, and $11,000 for miscellaneous.

Citizens Gas & Coke Utility, Indianapolis, has budgeted $1,315,000 with $435,000 for production, $700,000 for laying 14 miles of feeder line, and $180,000 for 30 miles of distribution mains. Mixed gas capacity will be increased 3.5 Mcf per day for peaks by 1952.

City Public Service Board, San Antonio, is spending $1,791,000 on distribution to take care of load growth in that city. Approximately 80 additional miles of ditribution mains will be laid, making gas available to 7500 to 8000 new customers.

Coast Counties Gas & Electric Co., San Francisco, has set up a 1951 budget of $1,480,000 including $344,000 for new business mains, $451,000 for additions for capacity, $120,000 for replacements, $174,000 for meters and regulators, $262,000 for new services, $46,000 for replacement services, $45,000 for capital tools and equipment, $18,000 for automotive, $6000 for office furniture and $14,000 for land and buildings. Under additions for capacity are two projects which are part of a long-range program in Contra Costa county

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begun in 1946 and tentatively planned for completion in 1955. The first project is for approximately five miles of 8-in. line from Walnut Creek toward Danville, and is estimated at $99,500. This is designed to reduce the pressure requirements of the system from 140 to less than 100 psi. The second project is for 2½ miles of 10-in. line from the terminus of an existing 10-in. line to the town of Lafayette, designed to deliver an additional 4100 Mcf per day to that area at an estimated cost of $72,000. These projects will benefit the southern portion of Contra Costa county.

Consolidated Edison Co. Inc., New York, has allocated $10.7 million for 1951. Production will get $4.3 million; storage plants, $300,000; transmission and distribution, $6.1 million. Of this, approximately $1 million will be used to complete conversion of water gas sets at Hunts Point and Astoria to operate on natural gas. Natural gas mains and appurtenances will cost $1.3 million, and new business and general improvements are estimated at $3.7 million. Fifty miles of distribution mains will be laid. An additional 15 MMcf per day of mixed gas for firm service will be available in May. The company plans on changing part of the area served to 1000-Btu gas this year.

Consolidated Gas Electric Light & Power Co. of Baltimore is spending $3.4 million including $500,000 for production to be used in converting four units to produce high-Btu oil gas. The capacity of these units after conversion will be 16,800 Mcf, making the company's total high-Btu oil gas capacity 101,200 Mcf. About $2.9 million has been allocated for distribution, including approximately 30 miles of mains.

Consumers Gas Co., Reading, Pa., has allocated $352,015 including $166,851 for production and $185,164 for distribution. The production budget will be broken down with $10,000 for miscellaneous improvements, $26,588 for a 40-psi gas engine compressor, $70,000 for a 10-psi gas engine compressor, $20,000 for river water pumps, $14,000 for addition to catalytic cracking plant, and $26,263 for a cyclic catalytic cracking unit. Distribution will allot $30,000 for miscellaneous improvements, $72,414 for 10 miles of mains, and $82,750 for customers plant. The company is planning on changing to 800-Btu, .58 sp gr manufactured gas during 1951.

Consumers Power Co., Jackson, Mich., has budgeted $9,767,160 for this year with $31,500 slated for production; $1,816,000 for transmission; $331,000 for pumping and regulating; and $7,588,660 for distribution. Installation of 73 miles of transmission line and 329 miles of distribution mains is planned. Marion, Bellevue and Olivet are new areas to be served.

The Dayton (Ohio) Power & Light Co. is spending $10,252,700 over a long range program of expansion started in 1950, to be completed in 1955. A budget of $2,652,700 has been set up for 1951 with approximately $1.5 million to be spent for normal expansion of facilities including main for new housing, tie-ins for pressure improvement and for maintenance, new services, and meters. The balance is allocated for installation of new feeder lines, replacement of inadequate feed lines, and extension of medium pressure system to areas where a larger supply of gas is required because of added loads. Approximately 275 miles of 3-in. equivalent distribution mains will be laid, upping present output by 40 MMcf per day.

Department of Public Utilities, Colorado Springs, Colo., will spend $273,000 for distribution and will lay 20 additional miles of mains to reach new and previously unserved areas in Colorado Springs and Manitou Springs.

Department of Public Utilities, Richmond, Va., will spend $1.5 million this year, including $1 million for new gas extensions and services, $25,000 for production facilities, and $475,000 for transmission. Line to be laid includes 12 miles of transmission and 20 miles of distribution mains. Henrico county, adjacent to Richmond, will receive service for the first time.

The East Ohio Gas Co., Cleveland, is spending $13,366,000 in 1951—$305,000 for production, $966,000 for storage, $4,547,000 for transmission, $6,977,000 for distribution, and $571,000 for general. The program includes installation of 65 miles of transmission line and 195 miles of mains.

Gas Department, City of Corpus Christi, (Texas) is spending its entire budget of $150,000 on distribution. Development of new subdivisions in the city will include the laying of 20 miles of mains.

The Gas Service Co., Kansas City, is allowing $4 million for distribution facilities and will lay 200 miles of mains. The 200 communities currently served by the company will benefit from the 1951 construction.

The Harrisburg (Pa.) Gas Co. is spending $692,086 as this year's part of a 1947-54, $4,515,696 program. Nine miles of distribution mains will be installed. The year's projects will make available an extra 37 MMcf of manufactured gas per day for firm service.

The Hartford (Conn.) Gas Co. is spending a total of $1,750,000 over a period starting in 1949 and extending to 1953. The 1951 allocation totals $1,012,710, including $47,350 for production, $115,500 for feeder mains, $138,300 for new business, $163,800 for services and meters, $20,900 for autos, $250,000 for plant changes, $250,000 for pressure mains, and $26,860 for miscellaneous. Approximately six miles of transmission line and eight miles of distribution mains will be laid. The firm is anticipating the early arrival of natural gas, at which time the system will be changed from 530-Btu manufactured gas to 800-Btu mixed gas.

Indiana Gas & Water Co. Inc., Indianapolis, will spend a total of $1,567,000. Production outlay will total 54,000, distribution $885,000, transmission $501,000, service buildings $64,000, automotive equipment $39,000, office equipment $24,000. About 18 miles of transmission line will be laid as well as 13 miles of distribution mains. The city of Rochester, Ind., will be changed from 570-Btu manufactured gas to 1000-Btu mixed gas, affecting approximately 1100 customers.

Interstate Power Co., Dubuque, for a long range expansion program to be completed in 1952 has allocated $1,428,672, of which $839,725 is for the 1951 budget. Of this year's portion, $738,500 will be spent for transmission and $101,225 for distribution. About 32 miles of transmission line will be laid, as well as 7 miles of distribution mains, making available an additional 4603 Mcf per day for firm sendout. The company expects to change over to natural gas either late in 1951 or early in 1952. Areas to benefit from the 1951 program include Clinton, Iowa and Albert Lea, Minn.

Iowa Electric Light & Power Co., Cedar Rapids, Iowa, is spending its entire allocation of $312,514 on distribution. Fifteen miles of mains will be laid and service will be extended

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to State Center. Cities already served which will benefit from the projects include Boone, Ames, Marshalltown, Colo, Nevada, Jefferson, and Collins. The company contemplates changing over to liquefied petroleum gas within the year.

Iowa-Illinois Gas & Electric Co., Davenport, Iowa, has allocated $2,268,000 for its 1951 construction program. Included are $1,448,000 for mains, $350,000 for services, $200,000 for meters, and $160,000 for new equipment. The expenditure for mains includes $650,000 for work classed as pressure improvement, which is part of a four-year, $3,650,000 program started in 1950. This year 103 miles of distribution mains will be laid. An additional 28,704 Mcf per day for firm service is expected from the firm's supplier by November. Areas presently served which will benefit from the 1951 program are Moline, Rock Island, East Moline, Silvis, and Milan, Ill.; Davenport, Bettendorf, Cedar Rapids, Marion, Iowa City, University Heights, Coralville, Ottumwa, Fort Dodge, and Manson, Iowa.

Kings County Lighting Co., Brooklyn, is spending $1,050,000 with approximately 75% of this expenditure directly related to the conversion from mixed and reformed gas to straight natural gas. The changeover will be completed by the end of this year. Production will receive $190,420, transmission $54,540, distribution $738,575, and general plant $66,465.

Laclede Gas Co., St. Louis, has set aside $10,749,000 for 1951. Of this, $1,797,000 has been allocated to production and will include construction of a new LP-Gas peak shaving plant with tanks, compressors, buildings, and miscellaneous equipment. Distribution has been allotted $8,082,000 for construction of 143 miles of mains for general strengthening and reinforcement of the distribution system, and purchases of meters, regulators, etc. Miscellaneous work will cost $870,000. The new peak shaving plant will make an extra 20.5 MMcf of LP-Gas available per day. The city and county of St. Louis will benefit.

Louisiana Power & Light Co., New Orleans, is allocating its entire budget of $675,000 for distribution and will lay 45 miles of mains.

Madison (Wis.) Gas & Electric Co. has allocated $311,722 for 1951 construction — $168,395 for gas mains and leak clamping, $65,597 for gas services, $70,994 for customers' meters, and $6736 for general plant. The company will lay an additional seven miles of distribution mains. Madison and adjacent areas will benefit.

Metropolitan Utilities District, Omaha, has $4.5 million to spend over a long range program of expansion with $1,635,010 allocated for 1951. This will be broken down with new town border stations receiving $35,000 and five new district regulator stations, $86,000. Also included are $5400 for enlarging six existing district regulator stations, $616,950 for high pressure distribution mains, $51,700 for high pressure industrial mains, $90,060 for intermediate high pressure industrial extensions, $330,300 for low pressure mains, $30,000 for new propane storage (two 30,000-gal. tanks), and $377,600 for ten additional construction and rehabilitation projects. About 21 miles of distribution mains will be laid. These projects will make available an additional 30 MMcf per day of natural for firm service.

Milwaukee (Wis.) Gas Light Co. has allocated $8.4 million for 1951, which is a portion of $35 million to be spent over a long range program of expansion extending to 1955. Production will receive $250,000, distribution was allotted $7.5 million to be split between distribution mains, services, and meters, and $650,000 will be used for miscellaneous projects. Fifty miles of additional distribution mains will be laid this year.

Minneapolis (Minn.) Gas Co. is spending $4 million mostly for 43 miles of mains and service pipes which will make available an additional 135 MMcf of natural per day for firm service and 50 MMcf of manufactured and LP-Gas for peak loads.

New Orleans Public Service Inc. is spending $1,625,485 in 1951 with most of it allocated to distribution. Of this amount, $859,300 will be for service requirements of new customers and increased service to existing customers, including cost of meters and regulators; $390,000 for replacement of deteriorated and inadequate mains and services; $160,000 for additions and replacements of gas facilities in connection with street paving or other city work; $51,500 for improvements to gas distribution system, including 36 miles of main; $46,500 for connecting large commercial and industrial loads; $13,500 for miscellaneous, and $104,685 for general plant use.

New York State Electric & Gas Corp., Ithaca, is contemplating changing from manufactured to natural gas in some areas. The company will spend $2,980,000, including $9000 for production and storage plant, $2,056,000 for transmission mains and regulator stations, $609,000 for distribution mains, $150,000 for services, and $156,000 for meters. Fifty-nine miles of transmission lines will be laid, as well as 21 miles of distribution mains. Big Flats and Freeville will be served as a result of the expansion program. Also to benefit are Ithaca, Geneva, Auburn, Elmira, Cortland, Dansville, Owego, and Goshen, which receive natural gas, and Lockport, which is served manufactured.

Northern Indiana Public Service Co., Hammond, has a $40 million 1949-1957 budget with $7.5 million allocated for 1951. The breakdown shows $1,575,000 for production, $3,375,000 for distribution, and $2,550,000 for transmission. Major projects will consist of six miles of 6-in. supply line to Crown Point, pipeline storage for Hammond and Fort Wayne, and additional propane storage for by-products. Also included will be a 50-mile, 22-in. main from Burns Ditch to South Bend, approximately four miles of 16-in. main and 1.3 miles of 12-in. main as additional supply main to Fort Wayne. In all, 76 miles of transmission lines will be laid and 70 miles of distribution mains. A boost of 15,434 Mcf per day of natural will be made available in 1951, which will be upped to 109,520 by 1957. The company is contemplating a changeover from 570-Btu mixed gas to 1000-Btu mixed or natural for 20,000 customers in the South Bend, Plymouth, and Warsaw area.

Northern Oklahoma Gas Co., Ponca City, is spending $750,000 in 1951, including $650,000 for transmission and $100,000 for distribution. The firm plans to add 40 miles of transmission line and 15 miles of distribution mains. This program will extend service to towns in north central Oklahoma.

Oklahoma Natural Gas Co., Tulsa, has allocated $12,741,837 for construction during its fiscal year ending Aug. 31. Production will take $651,766 for leaseholds and drilling costs, with $6,195,511 for transmission to cover connecting gas reserves and erecting compressor stations. Another $1,095,882 is earmarked for developing and equipping underground storage, and $598,980 for improvements and additions to gasoline plants. Distribution was allotted $2,755,024 for connecting new customers and improving service, with $1,444,674 for miscellaneous. Sixty-three additional miles of transmission line and 214 miles of distribution mains will be laid.

Pacific Gas & Electric Co., San Francisco, is spending $31.7 million with $500,000 for production, $13.1 million for transmission, and $18.1 million for distribution. Major projects will be construction of three compressor stations (at Topock, Hinkley, and Kettleman Hills) for the Topock-Milpitas pipeline project in order to make deliveries of about 400 MMcf per day through the 34-in. Texas line. Thirty-one miles of transmission lines and 800 miles of distribution mains will be laid. Capacity will jump from 200 MMcf per day to 400 MMcf by the fall of 1951. Central and northern California will benefit.

Philadelphia (Pa.) Electric Co. contemplates changing the heating value of its mixed gas from 520 to 800 Btu. The year's budget is set at $3,849,000, of which production will receive $616,000, distribution $2,728,000, transmission $477,000, and miscellaneous $28,000. Plans include laying 12 miles of transmission line and 62 miles of distribution mains this year. Service will be extended to

some customers in the company's existing territory.

The Philadelphia Gas Works Co. has a budget of $36 million for a five-year program which started in 1951 and will be completed in 1955. For 1951, $11,970,207 has been allocated—production will receive $5,795,522, distribution $5,833,685, customers service $266,000, and miscellaneous $75,000. The principal items in the production budget will be propane storage tanks and equipment to insure against loss of natural gas supply; the installation of cyclic catalytic cracking sets; additional gas engine compressors, plant mains, and holder capacity needed to handle the increased volume of gas; and replacement of low pressure with high pressure steam. The distribution budget includes mains, services, and governors needed to serve some 6000 new houses, as well as a general reinforcement of the transmission and distribution systems. Approximately 14 miles of transmission line will be laid, along with 49 miles of distribution main. Capacity for firm service will jump 123 MMcf per day of mixed gas of 650-Btu equivalent by the winter of 1955-56.

Public Service Co. of Colorado, Denver, is spending $5,606,000 including $1000 for production, $5,242,000 for distribution, and $363,000 for transmission. About 120 miles of transmission line will be added, and service will be extended to Grand Junction, Sterling, Brush, and Fort Morgan.

Public Service Electric & Gas Co., Newark, has allocated $14.2 million for 1951, to be split among production, $3 million; distribution, $10.5 million; and miscellaneous, $700,000. Among major production items are two new boilers, additional equipment and piping for utilization of natural gas, and napthalene scrubbing equipment. Distribution covers addition and improvements to mains, services, meters, and shops. An estimated 140 miles of mains will be laid. It is the company's plan to distribute a mixed gas of higher heating value, with maximum contemplated heating value of 650 Btu.

Republic Light, Heat & Power Co. Inc., Buffalo, is spending $981,000 including $19,000 for production, $273,000 for transmission, $622,000 for distribution, and $67,000 for miscellaneous. The company will build five miles of transmission line and 20 miles of distribution mains.

San Diego (Calif.) Gas & Electric Co.'s gas department has requested a budget of $2 million with approximately $12,000 to be spent for transmission and the balance for miscellaneous and scattered distribution system improvements. About 125 additional miles of distribution mains will be laid.

Seattle (Wash.) Gas Co. is spending $301,000, primarily for replacements or refinement of existing facilities. Production will use $101,000; distribution, $150,000; general office, $40,000; and sales, $10,000. The presently served cities of Seattle, Kent, Renton, and Tukwilla will benefit.

South Atlantic Gas Co., Savannah, has a budget of $249,541, including $8735 for plant, $110,753 for distribution, $64,956 for propane facilities, and $65,097 for miscellaneous. Savannah, Orlando, and St. Augustine will benefit.

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South Carolina Electric & Gas Co., Columbia, has set up a budget of $389,950 to be split with production receiving $109,000 and distribution $280,370. Six miles of main will be installed.

Southeastern Michigan Gas Co., Port Huron, which acquired the manufactured gas properties of the Detroit Edison Co. early this year has set a budget of $1.5 million. Of that, $1,450,000 is the estimated cost of building a 12-in. natural gas line from Clawson to Marysville, Mich., a distance of approximately 55 miles. The remaining $50,000 will be spent in maintaining and extending the distribution system. The company contemplates changing over to 1000-Btu, .68 sp gr natural gas during the year. The 1951 projects will make available an additional 5 MMcf per day on an interruptible basis. Northern Macomb county and St. Clair county will benefit from the year's projects.

Southern California Gas Co., Los Angeles, has budgeted $28.8 million for expansion (excluding transmission improvements) during 1951. Largest single item is $17,757,000 to extend service to new customers and to make reinforcements, extensions, and replacements in the company's distribution system.

Southern Indiana Gas & Electric Co., Evansville, has allocated $442,801 for 1951. Plant additions and improvements will account for $2500; main extensions for new business, $158,000; additions and improvements to distribution system, $241,461; meters and installations $40,840. Seventeen miles of distribution mains will be laid. Evansville and Newburgh will benefit.

Southern Union Gas Co., Dallas, will spend $7,843,420 to be split among production with $2,607,844, transmission with $1,280,300, distribution with $3,563,504, and general with $391,772. About 48 miles of transmission line will be laid. New cities to be added to the system include Holbrook, Winslow, Flagstaff, Williams, Prescott, Seligman, and Kingman, Ariz. Completion of this project will make available by October 1951 an additional 27 MMcf of natural gas per day for firm service and 24 MMcf of LP-Gas per day for peaks.

Southwestern Public Service Co., Amarillo, Texas, has set a budget of $241,095 with distribution receiving $238,295 and transmission $2800. The firm plans on laying approximately 15 miles of distribution mains this year.

The Tampa (Fla.) Gas Co., plans on spending $50,000 this year with $5000 slated for production, $40,000 for distribution, and $5000 for miscellaneous.

Union Gas System Inc., Independence, Kan., has allocated $521,909 for the year's construction, including $78,286 for production, $260,955 for distribution, and $182,668 for transmission. The majority of this budget will be used for replacement and reconditioning work in the 40 communities presently served.

Virginia Electric & Power Co., Richmond, has set a 1951 budget of $1,282,100. Specific allocations are $295,300 for its Peninsula district, $509,800 for the Norfolk district, and $477,000 for blanket improvements including short line extensions in both districts. The company will change over from manufactured to natural gas during the year. Accordingly, most of the year's expenditures will be for main connections to the supplier's line.

Washington Gas & Electric Co., Tacoma, is spending $150,000 split among production, $60,000; distribution, $82,000; and miscellaneous, $8000. The expenditures include installation of two miles of mains.

Water & Light Dept., Duluth, Minn., has set aside $93,970 of which $65,000 will be for distribution and $28,970 for miscellaneous. The company will lay an additional two miles of distribution mains.

Wisconsin Power & Light Co., Madison, has allocated $500,000 for its gas department, with distribution being allowed $498,400 and production receiving $1600. The program includes construction of Fond du Lac-Ripon high pressure distribution feeder, valve replacements in high pressure distribution lines to permit higher pressure, construction of 20 miles of local distribution feeder lines, and general distribution betterments in all locations. Towns to benefit include Berlin, Ripon, and Beaver Dam, Wis.

Wisconsin Public Service Corp., Milwaukee, will spend $1,150,000 including $126,000 for production, $638,000 for distribution, and $386,000 for transmission. An additional 20 miles of transmission line and 22 miles of distribution mains will be laid.

Wisconsin Southern Gas Co., Burlington, plans to spend $600,000 adding distribution and transmission mains and enlarging existing mains. The program will involve installation of 50 miles of main of various sizes—8-in. and smaller.

Miscellaneous Companies, not to be identified, will spend a total of $5,583,928 this year and plan to lay 59 miles of distribution mains and 25 miles of transmission line.

Why Consider Only HALF

Of Our Off-Peak Problem?

By HARRY B. WILSON
Brooklyn Union Gas Co.

THE two most important factors in any study of the off-peak problem are (1) the off-peak rate and (2) the cost of equipment.

In my opinion we have given far too much attention to the first of these two factors and as a consequence have neglected the second. We have concerned ourselves almost entirely with various ways and means of lowering the off-peak rate to a point where it can compete realistically in a highly competitive field, and have failed to realize that a more effective attack on the problem may lie in the lowering of initial equipment costs.

Until recently, a customer who wanted to use off-peak gas was required to purchase and install what amounts to a completely new and expensive gas-fired water heating system in addition to his existing competitively fired plant. This circumstance more than any other has been responsible, in my view, for the limitation of off-peak gas sales. Obviously, then, if it were possible to reduce the cost of this gas-fired equipment, it would follow that the overall cost to the customer of using off-peak gas would be lowered in proportion and our competitive sales picture in this field would be considerably brightened. Fortunately a great deal of progress in this direction has been made during the last two years.

There are many things we cannot be sure of in these troublesome days, but it seems reasonably certain that there will be a very rapid growth in the sale of house heating, especially in areas which have secured a supply of natural gas. This increase in house heating volume will, of course, result in a worsening of the load factor. And it should mean that the management of the companies involved will investigate every possible means of building up their off-peak loads by way of re-establishing a favorable load factor.

One of the most obvious helps in leveling off the peaks and valleys of the load curve is, of course, the sale of off-peak gas for volume water heating in apartment houses and large commercial and industrial enterprises. The purpose of this paper is to point up the advances that have been made in the design of equipment for this field and to suggest possible approaches to the problems involved in the sale and servicing of large volume jobs.

1. Fuel Door Burners for House Heating Boilers.*

Description. These burners which the Handley-Brown Heater Co. has developed have a maximum input of 300,000 Btu's per hour. It is expected that they will be available for distribution in time for the beginning of the 1952 off-peak season. The weight of the burner less accessories is about 40 lbs and the burner is easily installed and removed by one man. The price will be approximately $120. The part of the burner which fits inside the boiler is 42 in. to 48 in. long. A rectangular secondary air duct runs the entire length of the burner.

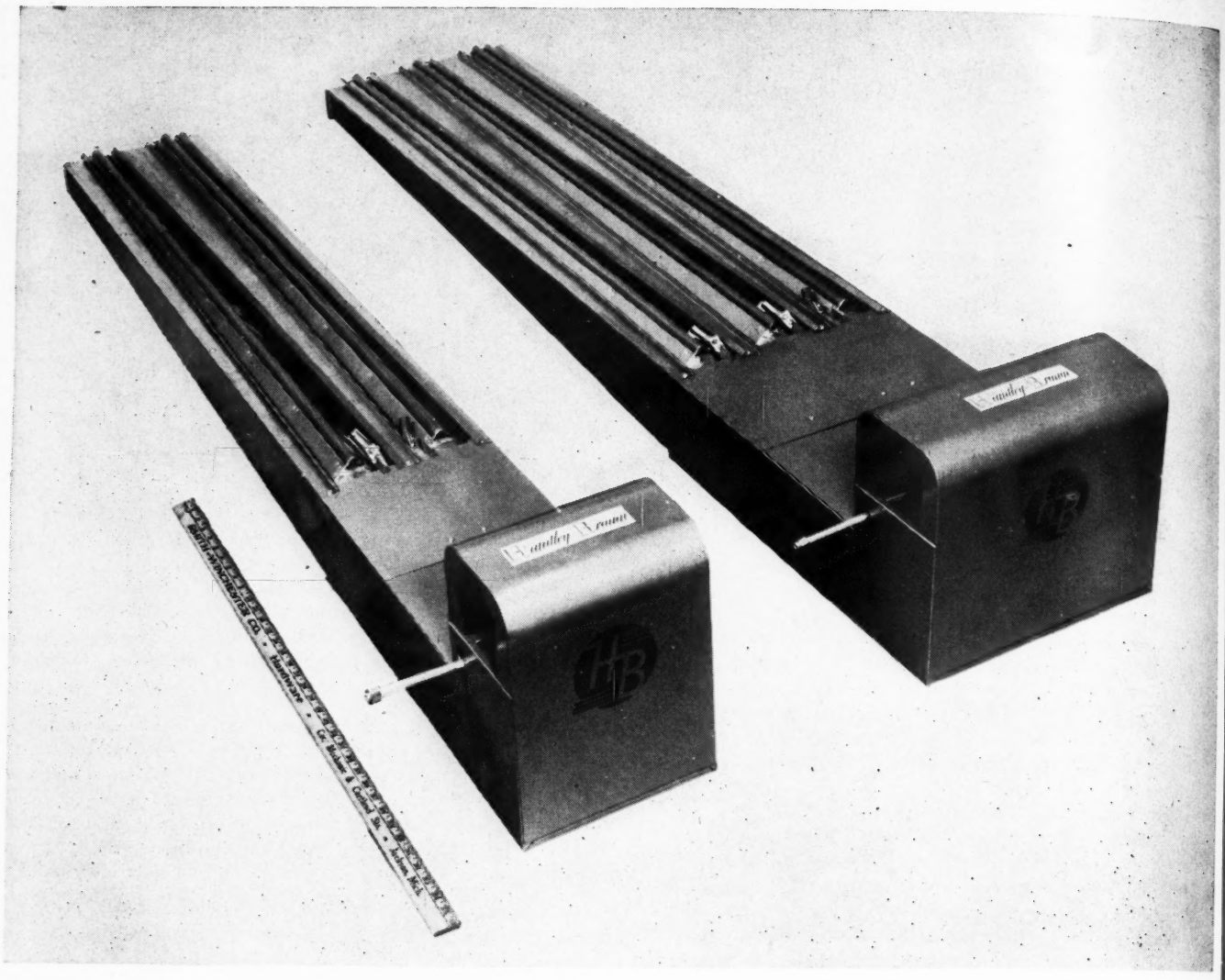
Application. These burners are designed for house heating boilers equipped to supply hot water either through a generator and storage tank or an immersion coil. Experience shows that the input can be fired efficiently at about 7% of the normal boiler input when a storage tank is used and from 12% to 15% if a storage tank is not used, making possible low cost equipment which can be easily handled.

Comparison With Previous Equipment. It is roughly estimated that the all-important equipment cost problem is reduced more than 80% (e.g. $1800 to $300 for 15- to 20-family houses). If there is already a separate water heating boiler and a storage tank in good condition on the job, it is probable that a conventional ash pit conversion burner or a fuel door burner would be used. The choice of these burners depends on whether the space heating boiler is used to supply hot water during the winter months. In this connection, it is to be expected that fewer storage tanks will be replaced in years to come because of the trend toward the use of one boiler for both space heating and water heating. When this is done, usually by installing a coil in the boiler, it is possible to supply hot water the year around from the space heating boiler.

Possibilities. There is ample evidence that this newly developed large atmospheric type burner is the answer to the problem of equipment cost. If three-year terms can be provided for the customer (regulations permitting), it is likely that three-year monthly payments of about $8 a month would pay for the equipment completely installed. In the meantime, the burner would make possible a saving in labor during the summer months, eliminating handling of coal and ashes. In addition, there would be a supply of hot water at an even temperature, causing less corrosion of the house piping than is caused by the greatly over-heated water often encountered with coal firing.

Operating Cost. Based on eight test installations for six summer months in Brooklyn Union territory, the gas consumption per family averages about 3600 cu ft per month, based on 540-Btu gas, an average inlet water temperature of about 60° and a daily consumption per family of about 60 gals. If used the year around, this consumption would have to be increased to 4000 cu ft per month.

*Connected for hot water supply.



FUEL DOOR BURNERS recently developed for house heating boilers. The 60-lb burner at left has 600,000-Btu input. Burner at right has 900,000-Btu input and weighs about 72 lb.

2. Coal Pot Conversion Burner.

Description. The burner we have used has an input of 40,000 Btu's per hour and is manufactured by E. C. Lundt, Inc. It is designed for use in coal pots with grate diameter varying from 10 in. to about 18 in. A dodecagon (12-sided polygon) horizontal steel baffle slate is installed about 4 in. above a miniature fountain type gas burner. This baffle causes the products of combustion to scrub the sides of the coal pot. (For a description of this equipment, see *GAS*, January, 1950, p. 30). Since a surface aquastat is used, the installation is inexpensive as compared to a gas designed water heater, because no work is necessary on the water pipes. The installation cost is further reduced by the use of a pilot generator to generate the necessary electricity to operate the controls. This eliminates electrical installation charge of about $45.

Application. It is designed for use in 4-family to 12-family houses. While it could very likely be used in smaller houses, there is not the need for it because of the ability of the standard domestic storage type water heater to take care of the small demand in these houses. The ease of removal and installation of the burner makes it useful for off-peak water heating also, in which case the small grates are easily installed for winter operation and removed for summer operation. About 4000 Btu's per hour input is allowed per family. In this way, about 20-hr operation of the burner is obtained. Storage tank capacities found on the job are usually based on about 25 gals. per family.

Comparison With Previous Equipment. The conventional practice in a typical case, such as in a 6-family house, is to install a large gas-fired volume water heater of about 200,000-Btu capacity. Even if the tank does not need replacing it is probable that the cost of conventional equipment would be about $650 installed. The net cost of the burner with controls, including surface aquastat, is approximately $42. Using this new setup, with the newly developed coal pot conversion burner, completely installed, the cost would be about $130.

Operating Cost. Based on the average family's use of 60 gals. of hot water daily, indicated by our data on 80 installations, it is estimated that the monthly consumption per family is 3600 cu ft when used for off-peak purposes. The year-around consumption has been found to average 4000 cu ft per month. The low input, 24,000 Btu's for a 6-family house, for instance, makes it possible in some cases to set the input to give the desired monthly bill, as we know that the number of hours of burner operation cannot exceed 24.

Possibilities. During these days of increasing coal costs and high labor costs there appears to be an excellent opportunity to sell these burners because of their low cost. Possibilities today are excellent as compared to the possibilities hereto-

fore because of the decrease in initial cost of about 80%. (See "Comparison With Previous Equipment" above).

3. Generator Hook-Up.

Description. The term "generator hook-up" is used because the gas boiler is used as a generator or heat exchanger during the winter months. This novel hook-up opens the door to relatively untouched markets. It consists of installing a small gas-fired space heating boiler as a generator to the main heating boiler. The boilers are interconnected so that the boiler water in the main boiler is pumped through the small gas boiler (acting as a generator) during the winter months. This gas boiler is equipped with an immersion coil. During the summer months the large boiler is shut down and the small, efficient gas boiler is put into operation. A small gas-fired steel boiler 20½ in. wide is available which will take care of up to about 35 families. This boiler is manufactured by the Viking Superior Corp. and is especially designed to utilize the stored heat within.

Application. This type of hook-up has two applications. One is in the new apartment house field where the builder would ordinarily install an immersion coil in the house heating boiler. No attempt will be made at this time to describe the important advantages involved in shutting down the large space heating boiler. The second application is in the existing market where a storage tank must be replaced or where for some reason the owner wishes to install an immersion coil or some type of heat exchanger in order to use the one large space heating boiler year around. This is in accordance with a growing trend. We then use the same type of reasoning as in the first application but with an additional important sales point which is described below. (See "Operating Cost.")

Comparison With Previous Equipment. In numerous new buildings, on alteration jobs, or where tank failures occur, the design of the immersion coil system lends itself to the "generator hook-up." It is estimated that the initial cost including the complete installation is reduced about 30% as compared to the cost of an entirely new conventional gas-fired water heating system. Initial cost is not the only factor in such cases because the custom is to install an immersion coil and to eliminate the use of a storage tank. The conventional gas-fired water heater, therefore, would not very likely be used. In this case, of course, the "generator hook-up" makes it possible for the customer to benefit by the advantages of operating one boiler using a lower priced coal or oil during the winter months. Based on delivered only costs, the cost to Brooklyn Union of the average size gas-fired Viking immersion coil boiler would be about $600, or roughly the same cost as conventional gas-fired water heaters. The 30% previously referred to results from the lower installation cost of the immersion coil heater since there is not a large storage tank to purchase and install.

Operating Cost. Usually the alteration required to use one boiler the year around pays for itself because the fuel used in the large boiler is approximately $14-per-ton coal instead of the $24-per-ton coal used in the small boiler. The saving may even be greater if No. 6 oil is used in the large boiler. Accordingly, assuming the operation of one boiler using the lower price fuel rather than two boilers, the fuel saving during the winter months may amount to about 40%. The saving during the summer months depends on the gas rate. It is expected that the combination of a relatively low off-peak gas rate and a highly efficient gas immersion coil boiler will show substantial savings during the summer months over a competitively fired boiler which would be greatly oversize for the summer water heating job.

Possibilities. With natural gas, helped perhaps by off-peak rates, there appears to be an excellent opportunity to add off-peak gas sales with the use of the so-called "generator hook-up." This is particularly true in the case of the No. 6 oil which does not burn as well during the summer months when steam pressure is not maintained in the boiler. This often results in a preheating problem. The short "on" periods in an often non-incandescent combustion chamber aggravate the problem of burning a low grade oil.

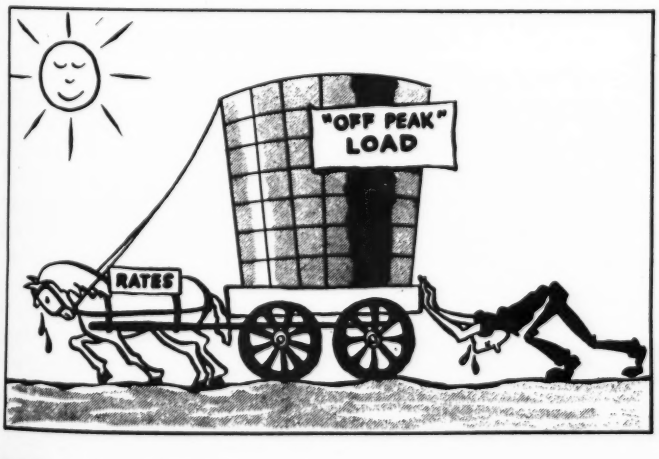
4. Combination Gas-Oil Burner.

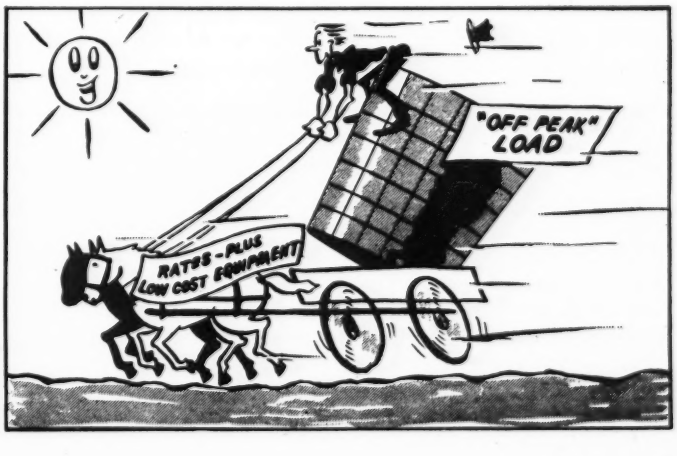
Description. There are burners on the market of this type which have proven their practicability for various industrial uses. There are also some burners designed for use in space heating boilers which are used for heavy oil but there is none available, to the writer's knowledge, for use with No. 2 oil with inputs in excess of 200,000 Btu's per hour. Combination gas-oil burners are designed to burn either oil only or gas only and may be easily changed from one fuel to another.

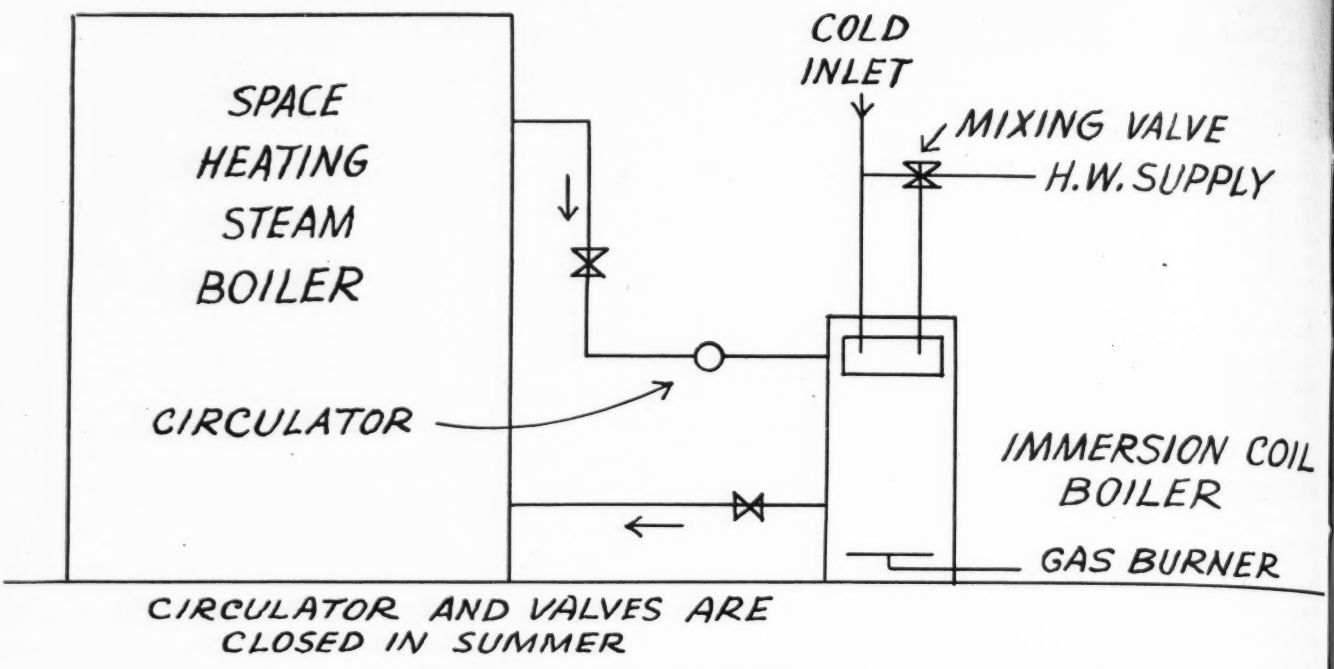
Application. These burners can be used almost entirely instead of straight oil burners in localities which have an off-peak rate, because in most instances heat is needed during the summer months for hot water or various non-space heating steam uses.

Comparison With Previous Equipment. Many companies have not begun to utilize this combination type of burner. Consequently, they have found it necessary to quote the installation of an entirely new gas-fired water heating system even if this system would only be used for off-peak use. The difference in cost between the standard oil burner and the cost of a combination gas-oil burner would be a very small fraction of the cost of the new gas-fired water heating system. Consequently, gas may be utilized as an off-peak fuel at little additional initial cost.

Operating Cost. The operating cost in this case would have







SCHEMATIC SKETCH of the generator hookup.

to be figured on the basis of the usual fuel equivalents since the same input would be utilized in the identical boiler.

Possibilities. The low equipment cost which is involved in making the use of gas possible opens the door to huge possibilities. The full exploitation of gas-oil burners cannot be realized, however, until manufacturers make available a burner designed to burn No. 2 oil with inputs above 200,000 Btu's per hour and extending as high as about 1.5 million Btu's per hour.

5. Combined Water Heating and Fringe Heating.

Description. The equipment used is the same as that described in section 1. These 300,000-Btu Handley-Brown burners are used in multiple, one alongside the other, in order to obtain an aggregate input of about 50% of the normal rating of the boiler. (Brooklyn Union has found that this input generates enough steam vapor or even steam pressure to heat an apartment house from March 15 to Nov. 15 or even as late as Dec. 1.)

Application. This burner can be used in steam boilers for heating apartment houses up to an indefinite number of apartments. The burner would be operated to give heat in much the same way as coal is used during the spring and fall months, by supplying steam from two to four hours in the early morning and the same length of time in the late afternoon. An electric timer switch set for the desired number of hours is helpful in shutting off the burner.

Comparison With Previous Equipment. No comparison can be made since, to the best of our knowledge, fringe heating in apartment houses has not been attempted before.

Operating Cost. This market, in which there has been little experience (confined to seven such installations in Booklyn Union territory in from 16- to 42-family houses), may some day be very important. This is true because of the fact that the off-peak load may be almost doubled as compared to the normal off-peak water heating potential, depending on the climate. The commonly used fuel equivalent of about 32 Mcf of 540-Btu gas per ton of coal is probably high in this type of application because of inefficient coal firing during very mild weather. During the fringe heating months, gas is at an advantage since it may be easily turned off and on.

Possibilities. The possibilities in this market are hard to estimate since more information is required. Further investigation is justified because of the tremendous effect fringe heating has on the potential off-peak load.

If it is decided to do something to fill in the summer valley in the load curve by using the equipment described herein, each company must organize a volume water heating group to be headed by a well qualified man who can be given a good amount of responsibility. The activity of this group will vary greatly depending upon the situation in its particular territory. The overall purpose of this group, or the individual who might be charged with the responsibility for the investigation, would be (1) to establish the theoretical potential in the territory and estimate the load which could be added over a period of years with certain assumed rates and (2) decide which of the types of volume water heating equipment are available and which could best meet the particular needs. Needless to say, this second phase would require a good knowledge of the market with particular emphasis on existing equipment and the manner of using the equipment. To be sure, the adding of an off-peak load will be a somewhat slow process because of the ramifications involved. Well trained personnel, assisted by attractive terms of payment, should be able to do much to add valuable off-peak gas.

To sum up:

The gas industry, as we have attempted to show, has not given sufficient thought and research to the all-important equipment problem. Too often our only concern has been with rate structures and the meeting of our competition's offer of low fuel costs; in this we have consistently overlooked the vital part the cost of equipment can play in obtaining off-peak business.

It would be foolish to maintain, of course, that the last word in the design of off-peak gas-burning equipment has been said. The equipment described in this report is unquestionably only the forerunner of even more efficient design. But adoption and intelligent use of the present equipment in cases where the summer "valley" in the load curve constitutes a serious imbalance in the load factor will not only help to level off the curve but should certainly lead to further refinements in design and discovery of other uses.

NATURAL GAS | It challenges the old, conservative business methods

Now is the Time to Overhaul Our Natural Gas Utilization Practices

By FREDERIC O. HESS
Selas Corp. of America

THE problem of conversion is complicated by the status of our present economy. The requirements of the defense program have imposed restrictions on materials, facilities, and manpower of manufacturers of all gas appliances and equipment. They are therefore trying to anticipate, with some apprehension, the demands of the New England conversion program, as well as the needs of the forthcoming expanding market. Regulators, fittings, and valves cannot be readily obtained in large quantities; priorities might have to be secured from Washington, a procedure which can easily involve weeks — in fact months. This is especially true of such items as meters and solder, and it might be well to recall the World War II experience of service departments with meters produced with low tin solder. *Here is a forceful example of essential cooperation between utility and manufacturer to exchange information, and in anticipation of requirements to take active steps to safeguard the utility and the public interest.*

Although his remarks are directed primarily at New England, which is soon to receive natural gas, the challenges Mr. Hess presents might be taken to heart by gas companies throughout the nation. In this paper, presented at the New England Gas Assn.'s annual meeting, March 29-30, he puts his finger on some sore spots among policies of both utilities and manufacturers which, through more closely coordinated effort, could be rectified.

This matter of requirements is in fact of concern to all branches of the appliance industry. More than ever manufacturers must be planning months in advance to effect deliveries, and they would be greatly helped in their efforts if they were advised of the *planned* expansion, of the expected requirements—for example, of the basic program for heating permits. All this should be done before the actual need for materials and services exists, because under today's conditions no quality manufacturer can adjust his schedules instantly to urgent demands regardless of how much he might wish to cooperate. New England has the reputation of being a wet-heat territory, and our manufacturers of heating boilers concern themselves with their anticipated requirements, compiling definite information, coordinating planning, setting up schools and service departments. They worry about the problem of available permits and about possible restrictions to new buildings only, which would severely restrict the market and appear to be unfair to old gas customers or equipment users.

It is generally recognized that the New England gas industry fought for many years an uphill battle, in view of rising prices, and also in rebuilding its selling organization. With the enlarged market in sight this selling organization should be well maintained to prevent competitive inroads, in spite of or because of possible shortage of equipment. It is expensive and time-consuming to build a sales force for specialized services and equipment in a highly competitive market. And competition we have—in the range field, in heating equipment, in water heaters, and, in commercial cooking. This load can be of appreciable importance; in fact in this market New England's average of $174 leads the national average of $142 per year in terms of revenue-per-commercial-customer.

Commercial cooking provides normally a good all year load factor and usually demands high quality equipment with necessary controls, all adding up to an excellent reference and a desirable customer. Maybe that is why electric competition is so actively going after the restaurant market, with its 200,000 potential, as well as all the hotels, universities, hospitals, etc., which make up the commercial heating load and offer a substantial revenue to the utility. Trained and active selling is vital to gain, hold, or expand the gas market—nor should any success be expected without close coordination and cooperation between utility and equipment manufacturers.

Gas appliance manufacturers know, of course, that without gas there is no outlet or market for their product, and consequently their aim is and *has* to be to promote the availability and sale of gas to enhance or restore the general acceptance of gas as fuel—be it for cooking, heating, water heating, incineration, laundry drying, refrigeration, industrial or commercial use, and all the other sound applications of this premium fuel. Gas appliance manufacturers also know, from bitter experience, that a low gas price does not necessarily hold their market, but has a tendency to also depress the selling price of the appliances—in many cases below a sound, profitable rate permitting effective merchandising, promotion and development.

They know, from the comprehensive statistics compiled by GAMA, of the steadily increasing percentage of electrical appliances, of the 1-to-1.5 ratio of electric versus gas ranges during 1950, of the appreciably higher average price of the electric range and its higher fuel or operating cost. And just a few weeks ago one of the major electrical appliance manufacturers announced an expansion

program of facilities for consumer items amounting to $140 million, an amount equal to all it had spent during the past five years for the same purpose. That predicts further fierce competition.

Gas appliance manufacturers know that during 1949 the average price of gas water heaters was $47, compared to an electric average of $63; and that during the first six months of 1950 the average gas water heater price was pushed down further by $3, which for 2 million units per year represents $6 million. This is a tidy sum which would readily pay for a sizeable program of promotion, research, and dealer cooperative campaigns.

Gas Supply and the Market

Manufacturers know that a short supply of gas and an undesirable load factor which has not been prepared for, planned, or economically offset or counterbalanced brings about local restriction of heating installations and reduces the market and manufacturing potential of such appliances and accessory controls and equipment. Manufacturers know these and many other depressing factors so well because they limit manufacturing activity, preventing sound planning and development. *Consequently more and more gas appliance manufacturers are being driven into competitive lines, into electric ranges, into electric water heaters, into oil burners, and so on, as a matter of self-protection, to maintain their obligations to their stockholders and their employees.*

All this takes place at an alarming rate in the face of the biggest gas pipeline expansion program ever undertaken anywhere, in spite of favorable economic conditions, and in striking contradiction of the inherent qualities and capabilities of gas.

Back Promotion with Performance

And manufacturers and utilities alike search for the "why," try to find answers and explanations and work out some remedies. On the selling and marketing side, some sound recommendations were developed from a joint cooperative conference between utility and manufacturer executives. These recommendations have just been distributed in a printed booklet, and they deserve careful study and action.

GAMA recently decided on a little self-help on its own. Enthusiastically and unanimously, a program of public relations and promotion has been adopted, and the foremost public relations experts have been engaged to counteract the trend of decreasing public acceptance and of competitive promotion. This program, which is nation-wide, began April 2. From its outline I quote the basic aims and purpose:

"A program for building new stature, public acceptance, and increased sales for the gas appliance industry through public relations and expanded sales promotion.

"To sell the public on using gas and gas appliances.

"To preserve and build the domestic, commercial and industrial gas load.

"To build greater unity and confidence among all members of the industry.

"To create a background of propaganda and public opinion favorable to what the industry wants the government to do for it.

"To increase the industry's stature and prestige with the public, the trade suppliers and government officials.

"To stimulate better and more aggressive merchandising, promotion and sales training on the part of utilities, distributors, and dealers."

Such an ambitious program will, without doubt, have a tremendous beneficial impact upon the entire gas appliance industry and gas utilities. It is amply financed, and the mechanism and personnel for execution have been carefully planned and selected to assure maximum effect; coordinated, long-range consideration; experience, and guidance.

This entire public relations plan is but one of many progressive steps essential for continued growth of the gas industry. In fact this very program will be nothing but a costly experiment or dream if it is not backed by performance of equipment and gas fuel. It seems generally agreed that gas appliances need to be upgraded, but different interpretations are made of this phase, depending on the position of the interpreter. No effective steps have been agreed upon to accomplish it.

Need for Appliance Research

Upgrading should mean better price structures, higher quality and thereby lower service cost, but it must also include better performance and continued improvements. That, in turn, requires active development and research, and in that respect the gas appliance industry will have to give a better account of itself in the future. *Too many gas appliance manufacturers undertake no research at all, have not changed their product in a decade, and do not utilize research data developed by the AGA Laboratories.* It is a harsh fact that most major changes in gas appliances were forced, in order to keep up with advancing competition. Manufacturers need encouragement, however; encouragement from the public and particularly from the utilities.

New England prides itself on being conservative, but that tradition has unfortunately established for New Englanders the reputation of being slow in promoting and accepting new developments. How can you expect the manufacturer to take risks and underwrite the cost of appliance development if you are unwilling to help him in his presentation and introduction to the public? Care and conservative caution is perfectly in order, but let us agree that too much conservatism, too much regard for "the old" leads us into the unenviable position of "dear old England." Let us all be courageously progressive in accordance with American tradition; let us be so especially in the gas business, which has lagged behind its competition, to its own detriment.

The Evil of Local Requirements

I mentioned before the trend of gas appliance manufacturers to abandon exclusive gas interest and establish products utilizing competitive fuels. One of the most compelling reasons for this trend, which of course affects the urgency and progress of gas developments, is the fact that many utilities establish local requirements for gas appliances instead of accepting AGA requirements. It is a matter of history that the electric industry began its accelerated growth with the establishment and universal acceptance of the Underwriters' Laboratory seal. The gas industry established the AGA Laboratories to perform a similar function, but local narrow interests undermine this aim to the disadvantage of the entire industry.

Suppose every town were to establish its own requirements for television sets, radio sets or electric motors, or, for that matter, television tubes or electric switches or fuses only? Suppose every other town had its own requirements for automobile carburetion, muffler or

"Too many gas appliance manufacturers undertake no research at all, have not changed their product in a decade, and do not utilize research data developed by the AGA Laboratories. It is a harsh fact that most major changes in gas appliances were forced in order to keep up with advancing competition. Manufacturers need encouragement, however; encouragement from the public and particularly from the utilities."

headlights to protect its citizens from exhaust fumes and blinding? We all know that progress would be stymied, production cost would be out of sight, maintenance and repair would be cumbersome, and movement and travel would be prohibitive, costly, and objectionable. And yet we tolerate these conditions in our own industry! We let it go on against our own selfish interest and against the interest of the public, which is compelled to pay a high price for special features and which is penalized nationally by prevention of mass production and concentrated research and development.

Solve Problems in the Laboratory

As long as we do not utilize our own laboratories for their intended and equipped purpose, we cannot complain about competitive inroads. Instead we guarantee our competition a 10-year advantage, and we prevent our customers from obtaining the service and the equipment the entire industry is capable and obligated to furnish. Do we really have to increase the inherent problems arising from gas combustion, ventilation, ignition, impurities in gas supply and service? Let us all concentrate on these major factors intensely and nationwide, and not be diverted and compelled to devote time and effort to minor problems and local regulations. The benefits to our entire industry and national living standards would be of a magnitude which is hard to visualize, except by comparison with other unified industrial activities.

In this vein lies probably the biggest opportunity ever offered such a heavily populated and large area as New England to advance the gas industry as a whole. New England has approximately 6% of the total population of the U. S., of which 17.4% are gas customers, against 15.2% for the balance of the country. That speaks well for New England—its high standards and concentrated population. On the other hand, the fact that the average revenue per customer is only $60 annually against $72 for the balance of the country would indicate obvious potential for expansion. This lower average is accounted for by substantially lower income per industrial customer because the average residential customer in New England accounts for $48.30 per year against $48.50 for the rest of the nation—practically identical amounts.

Provide a Uniform Fuel

These figures are interesting and illuminating, but for proper interpretation it is essential to make due allowance for price differentials per heat unit which exist now and will continue to exist in various parts of the country. The average residential consumption outside New England is more than 3½ times that of New England, measuring in number of therms.

Therefore, with a safely predictable enlarging market in the offing afforded by the introduction of large quantities of natural gas, it can be readily understood why appliance manufacturers desire to be informed of plans, distribution, and requirements, and wish to cooperate and coordinate with such plans to everybody's benefit. There is, moreover, some concern about this conversion to natural gas or, more accurately, mixed gas. All of New England will get natural gas from a very few pipelines—gas of reasonably uniform composition and burning characteristics. It is fervently hoped that the New England gas industry has sufficient foresight and enough fortitude to end up with a uniform mixed gas throughout its area. If every town has its own mixture and therefore different Btu values and burning characteristics, the appliance industry and the public both will be severely penalized.

"More than ever manufacturers must be planning months in advance to effect deliveries, and they would be greatly helped in their efforts if they were advised of the *planned* expansion, of the expected requirements—for example, of the basic program for heating permits. All this should be done before the actual need for materials and services exists, because under today's conditions no quality manufacturer can adjust his schedules instantly to urgent demands regardless of how much he might wish to cooperate."

Standardize Equipment

It is doubtful that the entire gas industry will ever have again the opportunity to standardize its fuel, as for example the electric industry did several years ago, but at least New England has now a unique opportunity to do so within its own area. All the local and technical problems, serious as they might seem, are insignificant to the tremendous gains which can be made in an area by a uniform gas supply that would afford standard equipment for the entire New England states instead of different burners, controls and heating results with all their complications of manufacture, shipment, service, and mobility for the customer. New England can indeed take a national leadership if it has the will and intent to achieve this major objective, this worthwhile dream of all forward-looking believers in the possibilities, potential, and importance of the gas industry.

Such a unified policy, if carried successfully to its objective, would deserve and command the wholehearted and best efforts of *all* equipment manufacturers. Instead of being kept out of the New England market, by not being able to afford the expense of numerous special appliances and design features, they would find they could not afford to stay out of the biggest, concentrated mass market for uniform gas appliances. Such a considerate policy of gas uniformity would obligate the appliance industry to assistance, to promotion, to development, and I am certain this obligation would be discharged, to everyone's gain.

The Hazards of Conversion

And let us bear in mind the important fact, all too often neglected, that gravity and Btu content are *not* the sole or most important factors. Gravity does *not* burn and Btu's do *not* burn—but the constituents of the gas burn and their composition and constancy determine the heating effect and the reliability of performance. That is, in effect, what the gas and appliance industry has been selling to the public; what it advertises; what it proposes to furnish, and what it has and should offer and deliver.

How serious this situation can be might be illustrated by conditions which have been created during the past year. A major utility converted to mixed gas of 650 Btu per cu ft and adjusted carefully for gravity to avoid major readjustment of the appliances or replacement of burners. The conversion is completed, rates have been adjusted proportionately, and life in the city goes on as usual. But the following facts remain: The new gas contains 18% hydrogen instead of 41% on the old gas, and 49.5% methane instead of 12% before.

The results, very briefly are these: Flame speed now is 1.4 ft per second against 2 ft per second before, or only two-thirds; and flame temperature now is 3475° F against 3650° F. This means that in a given combustion space where 3100° F could formerly be reached, a maximum of 2900° F is possible now, and by doubling the combustion space this maximum can be increased to 3050° F. Flame length used to be 1⅛ in.; now

it is 1½ in., and the time required to heat a thermocouple to 1300° F in the flame tip, formerly 45 seconds, is now 53 seconds. Does anyone believe these differences can be compensated for by the mere drilling of a burner or an orifice? Since the gas does not know the difference between a thermocouple, a teapot, or a frying pan, the heating effects will be of similar variance.

Why all the stress about efficiencies and AGA tests and safety and heating speed, etc., if we make wholesale alterations like that and expose these appliances—which necessarily include some of the latest—to competitive comparisons? Let me assure you that gas appliance manufacturers recognize the necessity for conversions and can and will design and develop burners for major requirements and gas compositions, but they cannot afford to design for every local condition, particularly when it is at such variance with either natural gas or any other mixed gas being distributed.

To make matters worse, the suburb of this same city is being converted to 800-Btu gas of entirely different combustion characteristics! It seems as if the expression *local* utility is being carried to the extreme, to the detriment of far more than only the local population. The appliance industry sincerely hopes and expects that New England will act in a more cooperative manner, and not bring upon itself, its customers, and the equipment industry such hindrances to progress.

The Role of Gas in Manufacture

Since my experience in the gas industry has been primarily acquired in the industrial field, I feel I would be missing an opportunity and an obligation if I did not refer to this important load and gas use. You know better than I do why the average annual revenue per industrial customer in New England is only $1293 against $4120 for the balance of the nation, in spite of natural gas rates. New England is an industrial community and prides itself justifiably on skillful manufacture and high quality products and production. Gas is ideally suited for such manufacturing plants; in fact it can and will materially contribute to the quality of the product at low unit cost if properly applied and used. The increasing supply of gas will offer immense opportunities in that direction, provide a year-around load of high value. Industrial gas is not a dump load at a dump rate, but very essential, first to the customer as a vital manufacturing tool, and second to the gas company as a broad all-year-around base load, capable of easing absorption of seasonal fluctuation of other gas uses.

An All-year Gas for Industry

There is no time for a detailed enumeration of industrial heating applications, or of the merits of gas over other fuels, or of the requirements of salesmanship for industrial use, but I do wish to stress two important factors. Most of New England seems to be desirous of having a steel plant in its area, and substantial progress is being made toward accomplishing this. There is a great deal of controversy about the economics of such a plant in the location, as to shipping cost, market, production cost, coal needs, etc. Far be it from me to discuss these points, but as a gas man with some experience in the steel industry I daresay, without qualifications, that a steel plant in New England—or anywhere else for that matter—should not be built today without adequate and reliable all-year gas supply. Modern mill practice, quality requirements, and quality control *demand* gas fuel for steel processing.

Let me illustrate with a widely practiced steel finishing process, the fusion of tin on electrolytic tinplate, such as is used for cans. This process requires heating of a continuous strip of steel, traveling at 1000 ft per minute or better, to approximately 465° F to melt the thin tin deposit on the surface. This can be done by electric induction at a cost per fuel, maintenance, and fixed interest charges of $125,000 to $175,000 per year, or at a cost of $50,000 per year with gas fuel. The initial equipment cost is from $350,000 to $500,000 for electric against $100,000 for gas equipment for equivalent production. These figures seem to recommend gas, and yet only approximately 5% of total tinplate production—about 4 million tons per year—is gas fused. Superior electric salesmanship is partly responsible, *but the unreliability of industrial gas fuel supply is the main factor.* A one-day fuel shutdown results in a loss of $100,000 product value, or more than three times the annual fuel cost. *You can give a tinplate mill gas fuel on an interruptible basis and it cannot afford to use it.*

There are many other heating processes in modern steel mill practice and in general industry which could serve to substantiate these facts. Interruptible gas supply for industrial process heating is a severe penalty on our entire industrial economy, and on our public relations. You cannot shut a plant down and talk or promote a superior *reliable* fuel. You cannot take a man's wages or production and offset the effects by "Gas has got it." You cannot shut pipe mills down for weeks because of gas shortage, and complain, with any degree of accuracy and logic, about lack of pipe for gas supply. You cannot penalize our entire industrial economy by asking for standby equipment at high investment cost without affecting the cost of the end product, your own cost and living expenses.

Work and Produce

You cannot successfully put the cart before the horse: first comes work and production, and then, and only then, an increase in standard of living and home conveniences. Let us resell this economic fact to our population and government, and let us practice it. And let us also recognize that constancy of gas composition and burning characteristics is vital to most industrial heat processes, that variations in composition can cost thousands of dollars product loss in a matter of hours or even minutes, in ceramic plants, in steel and brass mills, in heat treating operations, etc. And if the gas equipment has to be designed and constructed to protect against such damages, either it becomes competitvely high priced or any plus value of gas as a fuel is eliminated by making the installation suitable for substitute fuels. Industry can and is willing to pay a fair price for constant, reliable fuel gas service because gas today is indispensable for our production techniques, our quality, and cost requirements and needs.

"It is doubtful that the entire gas industry will ever have again the opportunity to standardize its fuel, as for example the electric industry did several years ago, but at least New England has now a unique opportunity to do so within its own area. All the local and technical problems, serious as they might seem, are insignificant to the tremendous gains which can be made in an area by a uniform gas supply that would afford standard equipment for the entire New England states instead of different burners, controls and heating results with all their complications of manufacture, shipment, service, and mobility for the customer."

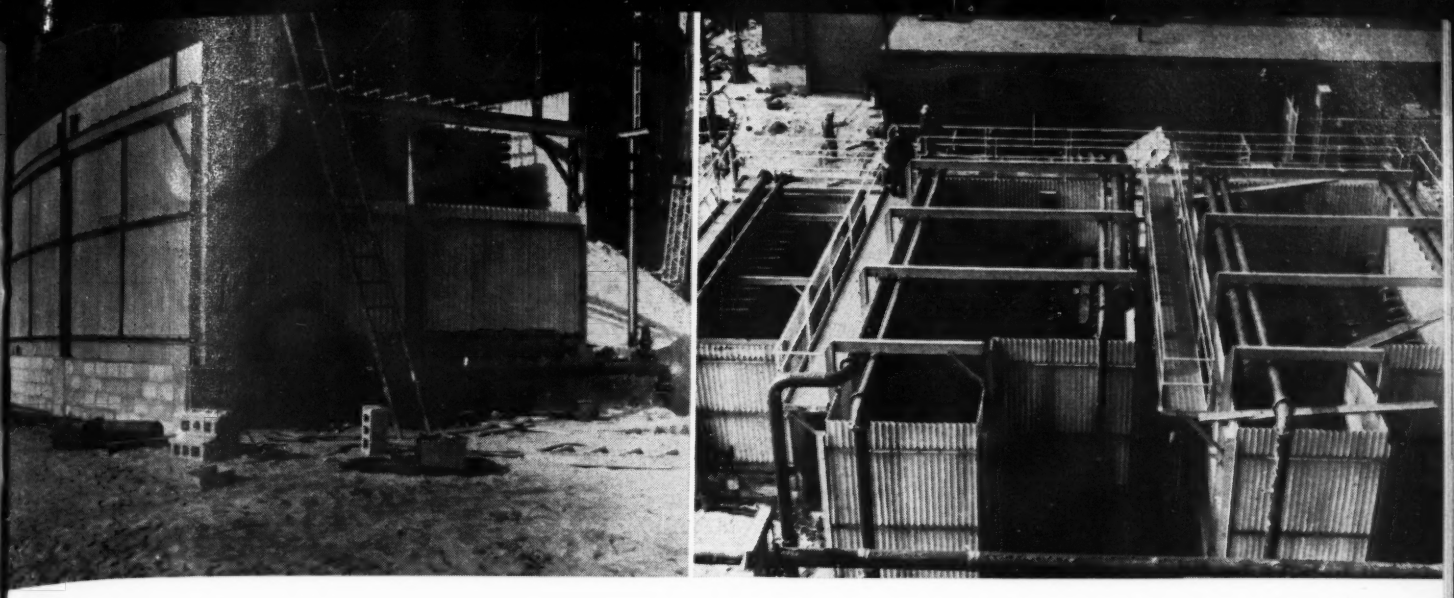


Fig. 1. Cooler for scrubbing liquor consists of three double banks of sections enclosed by steel-framed Transite walls.

Fig. 2. Cast iron cooling sections for compressor and engine jacket water. Compartment at left is for motor-driven compressors, and the other two compartments are for the two gas engine-driven compressor units.

LONG ISLAND'S CLOSED COOLING SYSTEM

Cast iron cooling sections employed for reforming and compression applications

THE method of cooling reformed gas compressors is among the outstanding features of a new gas conversion plant built recently by Long Island Lighting Co. The plant serves areas completely geared to the use of manufactured gas and therefore must convert natural gas into a gas closely approximating that produced by the company's several water gas plants in the Long Island area. Natural gas has become available from the Southwest through Transcontinental Gas Pipe Line Corp.'s line.

The plant was built at Glenwood Landing on the North Shore of Long Island to serve Southeastern Queens county in New York City and suburban Nassau and Suffolk counties.

The gas is reformed by a catalytic cracking process utilizing specially designed furnaces developed by Surface Combustion Co.* Plant capacity is approximately 35-MMcf of natural gas/day. After cracking, the reformed gas is enriched, stored in a new 5-MMcf holder from which it is pumped out through the high pressure mains of the company's distribution system.

Cooling water problems are associated with both the reforming process and with gas compression for distribution. In both instances it is necessary to employ recirculatory, closed water systems because ground water is not available in sufficient volume for a once-through system and sea water (available in unlimited volumes) would create a serious salt corrosion problem if used directly in this way.

The two basic cooling jobs are to cool the recirculating scrubbing liquor which cools and cleanses the finished gas, and to cool the fresh water that is circulated in the jackets of the gas compressors and their prime movers.

Reformed gas passes through a closed tower for a wet scrubber type of cleansing and cooling operation in intimate contact with sprayed water. This water picks up a large quantity of heat as well as residual impurities.

The equipment used for cooling all recirculated fresh water consists of built-up batteries of The National Radiator Co.'s cast iron cooling sections over which salt water from Hempstead harbor is sprayed. These cooling sections, being made of highest grade cast iron, have high resistance to salt water corrosion and have proven economical in both first cost and maintenance, particularly when there are large quantities of process solution.

The coolers were designed for a minimum of evaporative cooling in order to avoid salt incrustation. They are placed close together and are surrounded by Transite walls which accomplish this and also prevent salt mist from being blown over other corrodable structures or equipment made of carbon steel. *Fig. 1* shows the catch basin and steel-framed Transite enclosing structure just before completion.

The scrubbing liquor cooler is arranged in three parallel banks, each serving scrubbers for one of three Surface Combustion cracking furnaces. The three banks are interconnected in order to provide maximum operating flexibility. There are 418 sections in each bank which has two rows of sections in series, each row consisting of 11 parallel stacks, 19 sections high.

The combined cooler with 1254 sections was designed to cool 1800 gpm of scrubbing liquor from 140° F to 95° F when supplied with 2325 gpm of sea water at 70° F.

The cooling of water in the compressor and engine jacket system is similar to that for scrubbing liquor. Jacket water is circulated through closed systems and cooled by means of once-through salt water. Compressor jacket water must be kept within a temperature range of 113 to 90° F in summer and engine jacket water must be kept within a temperature range of 162 to 150° F.

There are five compressors. Two, which are driven by 2000-hp natural gas engines, are each provided with a cooler consisting of 256 National sections arranged in 16 parallel stacks 16 sections high. They cool 550 gpm of jacket water, using 633 gpm of sea water at 70° F.

Three compressors are electrically driven, one by a 2000-hp motor and two each by 800-hp motors. The latter two units are cooled by 208 sections arranged in 13 parallel stacks, 16 sections high. These sections cool 630 gpm of compressor jacket water from 113 to 90° F using 550 gpm of sea water.

Jacket water for the two gas engines, circulated at 1400 gpm, is cooled by 11 parallel stacks 10 sections high. Sea water flows over these cooling sections at the rate of 420 gpm to lower the temperature from 162 to 150° F. As shown in *Fig. 2*, these coolers are enclosed with coolers for the compressors which they drive.

*For a complete description of the plant, see *GAS*, May 1948, p. 47.

"At last! Guaranteed assurance"

How Charleston Was Cured of Poor Piping and Installation Practices

By E. E. BOEGLI

Exclusive

ON the night of Aug. 25, 1950, in the historic city of Charleston, S. C., 34 master plumbers, heating contractors, and gas utility men assembled for dinner. This meeting of allied interests in the gas industry was held for the purpose of organizing the "Better Gas Utilization Assn. of Charleston."

The members declared themselves an association for the mutual improvement and promotion of the various individual organizations to the end that whenever and wherever a member shall have to do with the sale, installation, and/or service of gas-burning equipment, it will be understood by the purchaser of such equipment or service that first-class equipment, workmanship, and material can be expected.

The reasons for this organization date back to 1948, when an intensive campaign was planned to increase our commercial and industrial gas load. This program had hardly gotten under way before one prospect after another informed us, "Your gas supply and gas pressures are inadequate to supply our present needs; why should we add more equipment?"

While we were able, in most cases, to assure the prospective customer that our gas supplies and pressures *were* adequate for his needs, we decided to investigate the causes for this rather prevalent conviction. After questioning customers, plumbers, heating contractors, and servicemen, we came to the conclusion that low pressure and lack of gas were the accepted answers whenever any gas-burning appliance failed to function correctly.

With a plant and distribution system capable of sending out 30% more gas under peak load conditions, we began to look for the cause of the difficulty. This search lasted 90 days during which time every major complaint of low pressure or lack of gas was thoroughly checked from the main to the appliance. This investigation brought to light these pertinent facts:

Charleston could be famous for old gas piping as well as old and historical buildings. Gas fuel lines originally installed to serve a gas range and possibly a water heater were being called upon to supply one to six space heaters that had been added from time to time. Pressure drops from 6 to 9 in. were found from the meter to the appliance in most of these cases.

Equipment had been installed without adjustment to our gas, and in some cases manufactured, natural, and propane gas equipment were connected to the same fuel line. Input of gas to the appliance varied from 40% to 180% of the manufacturer's rated input. House piping was run hit or miss and supported the same way, causing many natural traps for condensate that would surge and fluctuate the gas pressure under load conditions.

We found many cases of low gas pressure and lack of gas under peak load conditions. While the causes for these conditions lay in the customers' house piping, this overloading had been so gradual over the years that no one actually realized its seriousness. Everyone just took it for granted that the increased use of gas had outgrown the distribution system. If a gas range had a good flame during minimum load conditions and only a simmer flame under peak load conditions when everything was burning except the kitchen sink, it wasn't hard to convince any customer that the gas utility was at fault.

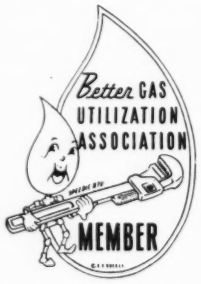
Obviously, it was important that some program to counteract this condition be instituted in order to successfully carry on any promotion for increased loads. An educational program aimed directly at the consumer was considered, but it was deemed advisable to contact first the persons on whom the customer depended for service. Most of us have, at one time or another, had to try to explain some erroneous remark of a serviceman. This tendency on the part of a housewife to accept as "gospel" the words of a serviceman indicated that any program of education should start with him.

A book entitled "Better Gas Utilization" was prepared, outlining the reasons it is necessary to correctly install gas piping and appliances. Examples of actual conditions were cited, as were the steps taken to correct such troubles as old and inadequate services, overloaded meters, piping and equipment adjustment. Tables were prepared covering all orifice sizes from ½ in. to No. 70 drill size in Btu, and number of cubic feet per hour for our gas at the various pressure drops of .1 to .7 was included.

Tables for various controls, regulators, and meters were also calculated for our gas. This information was so arranged that no formula had to be figured and any serviceman could correctly size piping pressure drops through controls and determine correct orifice and pressure adjustments in a matter of minutes.

This book was presented to all of the company servicemen at the first of a series of lectures on gas piping and installation. These lectures were given at weekly intervals for three months during the summer of 1949. Every phase of piping, installation, and adjustment of appliances was covered. We felt that this part of the program was extremely important, as these men would contact not only the customer, but dealers and their servicemen, and it was necessary that they pass on the correct information.

We were then in a position to take the second step. All master plumbers and heating contractors were invited to a dinner meeting on Aug. 19, 1949. The book "Better Gas Utilization" was presented to everyone present and the reason for its existence was explained. Blackboard discussions were held covering every phase of gas piping, and ex-



Correcting widespread misunderstanding of proper practices for installing appliances and controls, which was giving gas service a bad name in Charleston, was the job that faced the South Carolina Electric & Gas Co. To achieve this goal, the company undertook a vigorous campaign of education of both customer and installer, setting up proper installation practices under the aegis of a new organization, the "Better Gas Utilization Assn. of Charleston." The figure "Speedie Btu," shown here, was adopted as the group's symbol.

Soundness of the program was officially recognized by the AGA last October when E. E. Boegli, its originator, was awarded third prize in the House Heating Progress Awards competition.

Mr. Boegli's article is the third and last in a series describing some of the prize-winning plans.

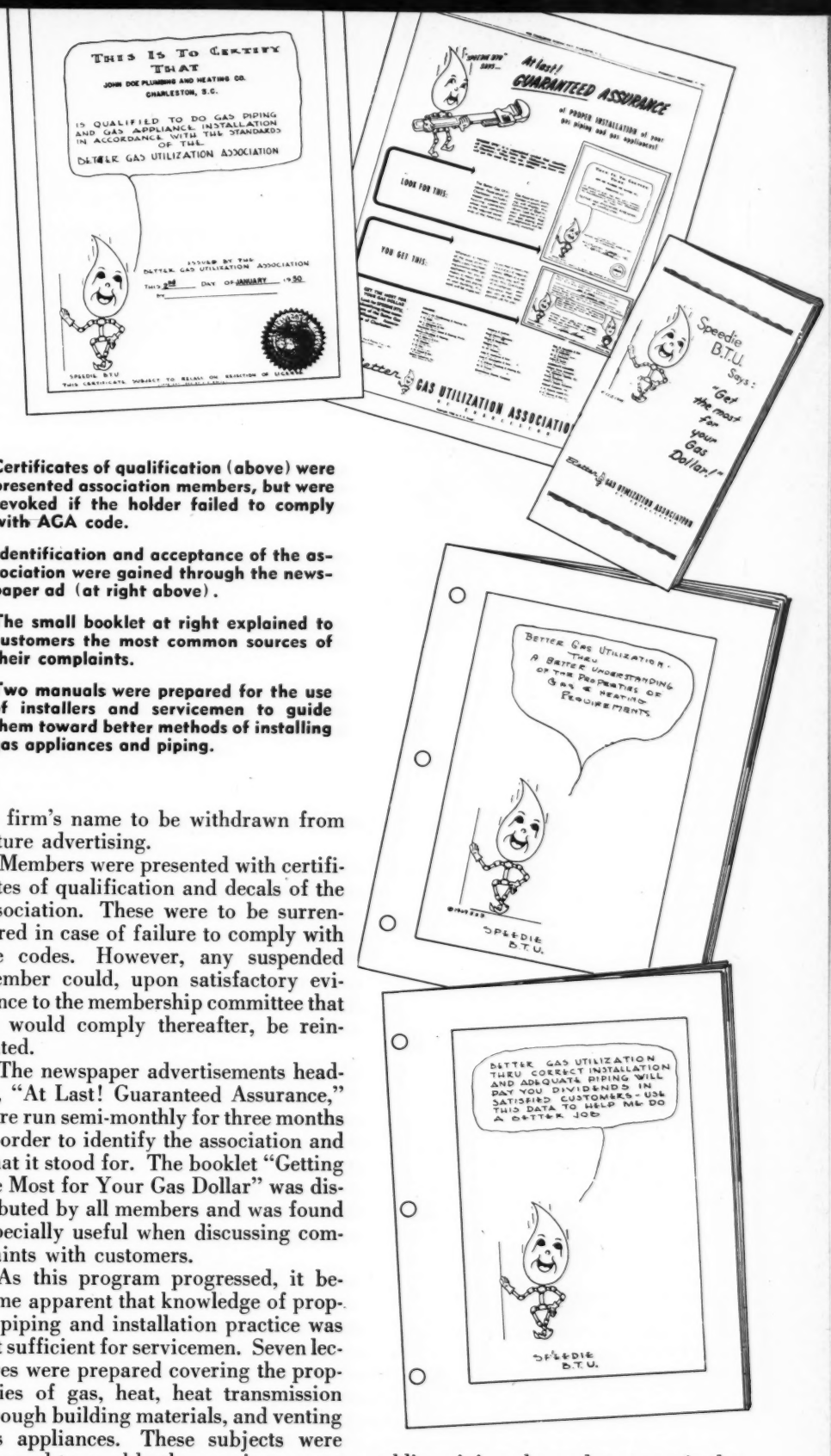
amples were cited of actual installations that had been corrected. It was rather a surprise to most of those present to learn that the conditions for which they had been blaming the utility were mostly of their own making. The utility, however, was held responsible, and rightly so, for not bringing to their attention the cause of these conditions. Most of those present expressed willingness to correct their methods of installation when it was pointed out to them that it meant better satisfied customers and fewer service complaints. It was at this meeting that an organization to control gas piping and appliance installation was first suggested.

Charleston, like many other cities, does not have an ordinance covering gas piping and appliance installation. Therefore, it was necessary to devise some method of assuring customers (1) that correct piping and installation would give more satisfactory service from their equipment, (2) that there were firms and individuals who would correctly perform this work according to standard codes, (3) that individuals or firms identified by some insignia or trademark were conforming to the standard codes and that failure to do so would prevent their further use of same, and (4) that an advertising program would carry a sincere message about better gas utilization.

After several months of experimenting with designs and figures, a gas flame with a body of gas pipe was decided upon. It was identified as "Speedie Btu." This figure was finally adopted as the symbol of the association. Certificates were prepared for display by members certifying their ability to correctly install piping and appliances. A smaller certificate was prepared for presentation to the customer, assuring him that the work done by the member had been done in accordance with the codes and had passed inspection by an authorized inspector for the association.

A full-page newspaper ad was prepared, giving in as few words as possible the object of the association and what it would mean to customers. A booklet, "Getting the Most for Your Gas Dollar," was prepared to explain the most common complaints from customers. With this material, we were ready for the organization meeting referred to in the opening paragraph.

The first full-page advertisement was run on Sept. 27, 1950, with 31 members listed. Each member had agreed in writing to adhere to the AGA proposed "American Standard Installation of Gas Piping and Gas Appliances in Buildings and Guide for Installers of Gas Central Heating Systems." Failure to correct a faulty installation or to make a new installation in accordance with these codes would cause the offending individual's or firm's name to be withdrawn from future advertising.


THIS IS TO CERTIFY THAT
JOHN DOE PLUMBING AND HEATING CO.
CHARLESTON, S.C.
IS QUALIFIED TO DO GAS PIPING AND GAS APPLIANCE INSTALLATION IN ACCORDANCE WITH THE STANDARDS OF THE
BETTER GAS UTILIZATION ASSOCIATION
ISSUED BY THE BETTER GAS UTILIZATION ASSOCIATION
THIS 2nd DAY OF JANUARY 1950
SPEEDIE BTU
At last! GUARANTEED ASSURANCE
LOOK FOR THIS:
YOU GET THIS:
GAS UTILIZATION ASSOCIATION
Speedie B.T.U. Says: "Get the most for your Gas Dollar!"
BETTER GAS UTILIZATION THRU A BETTER UNDERSTANDING OF THE PROPERTIES OF GAS & HEATING REQUIREMENTS
SPEEDIE B.T.U.
BETTER GAS UTILIZATION THRU CORRECT INSTALLATION AND ADEQUATE PIPING WILL PAY YOU DIVIDENDS IN SATISFIED CUSTOMERS - USE THIS DATA TO HELP ME DO A BETTER JOB
SPEEDIE B.T.U.

Certificates of qualification (above) were presented association members, but were revoked if the holder failed to comply with AGA code.

Identification and acceptance of the association were gained through the newspaper ad (at right above).

The small booklet at right explained to customers the most common sources of their complaints.

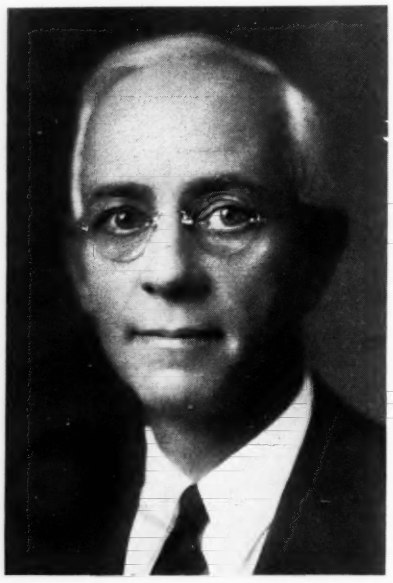
Two manuals were prepared for the use of installers and servicemen to guide them toward better methods of installing gas appliances and piping.

Members were presented with certificates of qualification and decals of the association. These were to be surrendered in case of failure to comply with the codes. However, any suspended member could, upon satisfactory evidence to the membership committee that he would comply thereafter, be reinstated.

The newspaper advertisements headed, "At Last! Guaranteed Assurance," were run semi-monthly for three months in order to identify the association and what it stood for. The booklet "Getting the Most for Your Gas Dollar" was distributed by all members and was found especially useful when discussing complaints with customers.

As this program progressed, it became apparent that knowledge of proper piping and installation practice was not sufficient for servicemen. Seven lectures were prepared covering the properties of gas, heat, heat transmission through building materials, and venting gas appliances. These subjects were covered to enable the servicemen to answer more intelligently the many questions customers expect them to answer. These lectures proved highly successful, and they are being enlarged upon for use by all association members and their servicemen.

The association holds monthly dinner meetings at which problems related to the industry are discussed. A very marked improvement in the quality of installations by the members has been noted. While the codes are voluntary, public opinion plays a large part in the successful operation of the organization. The fact that members advertise correct installation provides an incentive for them to give the best material and workmanship possible. The relation between the utility and the plumbers and heating contractors has improved tremendously. Many of the old overloaded house piping systems have been or are being corrected. Last, but not least, we no longer hear: "Call the gas company; it's a lack of gas or gas pressure."



It's a break for the customer

Why Even a Municipally Owned Utility Should Actively Merchandise

By W. S. BYRNE

ALTHOUGH UNSETTLED world conditions, with attendant threats to civilian production, have brought hesitation in some quarters, utilities for the past two years have been trending back toward the time-tested policy of direct selling of appliances.

In brief, their aim is to build their sales of gas and hold the line against the inroads of electrical competition.

On the face of it, considering only the profit motive, one might feel that a municipally owned utility such as the Metropolitan Utilities District of Omaha, Neb. would have little interest in building gas sales. What matter if customers are lured away by the blandishments of the competition? The customers are the owners, so what matter if the gas utility is reduced to a second-rate purveyor of energy?

It matters tremendously, not alone for customers as owners, but for customers—as customers.

And if it matters so much to a publicly owned utility, it must be doubly important to a privately owned company operating for profit.

Such are the logical conclusions to be drawn from the accompanying article, which is adapted from a report prepared a year ago by the utility in defense of its direct selling policies. Faced with pressure being brought to bear by local appliance dealers, both electric and gas, to force the district out of the appliance business, General Manager Walter S. Byrne rallied his sales staff and advertising agency, and drew up this report in rebuttal.

Although to a great extent the will of the dealers prevailed, resulting in the establishment of a dealer cooperation plan, the report presents some convincing arguments in favor of a strong direct selling policy.

Operation of the plan during the past year has been disappointing, declares Mr. Byrne, "confirming my belief that it is necessary for the utility to remain in the appliance selling field in order to help assure the retention of the domestic load."

THE Metropolitan Utilities District, like privately owned gas utilities, exists to render the best possible service to its customers at the lowest attainable cost. To do this it must operate efficiently because low rates to its customers (and, in our case, owners) depend on efficiency and volume of use.

Before gas has any value there must be appliances to utilize it. Appliances must be sold and installed. If these appliances could be introduced, promoted, and sold with complete effectiveness by independent merchants, there would be no need for such introduction, promotion, and sale by the gas utility.

It has been demonstrated in the history of the gas industry that independent merchants alone cannot do this job and that the primary responsibility and initiative for the introduction, promotion, and sale of gas appliances remains with the utility.

If the utility relinquishes this prerogative, it cannot operate freely, efficiently, and economically.

When the gas utility ceases to advertise, promote, and sell gas appliances it hands over the complete control of its operation, the fate of its enterprise, and its competitive future to a number of private merchants who have no proper interest except merchandise profit . . . who have no understanding of the economics of gas operation and distribution . . . who cannot afford, because of profit limitations, to give gas appliances proper promotion or service.

It is the primary responsibility of the Utilities District to see that gas appliances—such as ranges, water heaters, and refrigerators—of the highest type are made available to its customers, that these appliances are safely and properly installed according to the best engineering principles, and that they are properly promoted through merchandising and advertising so that the people of Omaha have a competitive choice between these gas appliances and electric appliances used for the same services in the home.

Unlike the electric utility, the gas utility does not have a great manufacturing industry—spending hundreds of millions of dollars in advertising and promotion—to back up the sale and promotion of appliances.

The electric industry has hundreds of appliances for the home—the gas utility has only the major ones. The electric industry has great and rich private corporations such as General Electric, Westinghouse, RCA, to name just a few from hundreds that carry on a continuing campaign for the use of electricity in the home in competition with gas. The gas manufacturing industry is divided, with few exceptions, into small units that do not have the money to spend in promotion.

For example: There are some 200 manufacturers of gas ranges, none of whom is large enough to do a real national selling job on gas as a cooking fuel. The American Gas Assn. is doing some work in selling gas as a fuel, but it is a mere drop in the bucket compared with the electric industry's tremendous barrage of propaganda. No gas water heater manufacturer does a major job of advertising his product nationally. Even the Servel refrigerator is modestly advertised nationally when compared with the frightening promotion on electric refrigerators which occupies hours of radio time on national hookups, uses hundreds of color pages each month in national magazines. All this manufacturing advertising is backed up by heavy electric utility subsidization on a local level.

Some idea of the tremendous pressure of electric appliance advertising locally may be gained from the statistics assembled by the Metropolitan Utilities District for Omaha and Douglas counties as shown on p. 47 (see "The dealer wasn't doing the whole job").

Much of the dealer advertising for gas appliances was inspired by the Utilities District advertising. Whenever the Utilities District featured a range or water heater in the *World-Herald* many dealers ran tie-in ads, which accounts for most of the total credited to gas dealers. If the Utilities District had not advertised, it is questionable if dealers

THE DEALER WASN'T DOING THE WHOLE JOB

IN ADVERTISING

A check of the Omaha *World-Herald* for the 12 months of 1949 reveals that electric appliance advertising outweighed gas tremendously:

	column inches
Total gas appliance advertising of all kinds, including Metropolitan Utilities District, dealer and manufacturers	7,624
Total electric appliance advertisements, including Omaha Public Power District, dealer and manufacturers	87,250

Thus, in newspaper copy alone electric out-advertised gas to the consumer approximately 12 to 1.

Claims made to the board of directors by the gas appliance dealers that they did *more* advertising for gas than the Utilities District are not borne out by the facts:

	column inches
Total space used by dealers and manufacturers for gas appliances in the *World-Herald* during 1949 was	2,995
Utilities District space for gas appliances in the *World-Herald* during 1949 was	4,629

Although it is impossible to check radio without a great deal of expense, those familiar with this medium estimate that electric out-advertises gas on local stations approximately 25 to 1. This is conservative.

In outdoor, the ratio is 4 to 1 in favor of electricity.

In street car advertising the ratio is about 4 to 1.

In miscellaneous media (weekly and foreign language papers, screen) the ratio is about 4 to 1..

In national magazines and periodicals coming into Omaha and Douglas county the ratio of electric to gas advertising is about 30 to 1.

IN MILWAUKEE

Take Milwaukee, as one example. Before the war the Milwaukee Gas Co. sold the gas refrigerator on an aggressive merchandising basis, similar to the present plan in Omaha. Based on Servel shipment records, the Milwaukee utility *sold 5000 refrigerators in 1941.*

Following the war the utility turned the sale of gas refrigerators over to dealers *alone.* Sale of refrigerators in Milwaukee *dropped* to 514 in 1948 and 348 in 1949 . . . a drop of 4500 units as compared with 1941.

This demonstrates what happens when the utility turns over the gas refrigerator to dealers. Milwaukee is going back into the merchandising of refrigerators because of the disastrous drop in sales through dealers.

IN GRAND RAPIDS

Take Grand Rapids. Here both utility and dealers sell the gas refrigerator. In this type of marketing the dealers make a very poor showing in sales, readily seen in the following sales comparisons:

Year	*Utility Sales*	*Dealer Sales*
1939	1102	149
1940	1503	184
1941	1389	88
1949 (10 mos.)	656	149

Even with cooperative help from the utility, the dealer does a very poor selling job in Grand Rapids as far as the gas refrigerator is concerned.

IN MINNEAPOLIS

Take Minneapolis. In this city the utility gives a *maximum* of support to dealers, paying 23 salesmen, conducting an advertising and a complete training and cooperative program. Even under these circumstances dealers fail to do as good a job as the utility alone.

Refrigerators sold by utility alone in 1948, without dealer help, totaled 1987. In 1949, under cooperative program, the gas company sold 600 units and the dealers 685, which is 702 units less than the utility sold alone in the previous year.

This tends to indicate that even with maximum cooperation, the sale of refrigerators tends to drop when dealers are depended upon in any degree to merchandise the gas refrigerator.

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would have done nearly the advertising they did.

It can be readily seen that the Utilities District is bearing the brunt of promotion and advertising in the Omaha market and that the competition is terrific, especially in the field of major appliances.

Experience has proved that the only way the gas industry can survive in this fight for competitive business in the home is for the local gas utility to advertise, merchandise, and promote. This policy has demonstrated itself to be effective for gas companies the country over . . . and Omaha is a good example. By prudent and modest promotion over a long period of years, the Metropolitan Utilities District has succeeded in keeping most of its cooking and water heating business . . . where less aggressive gas utilities (public and private) have lost their proverbial shirt to the aggressive electric industry. One Omaha electric dealer pretty well summed up the situation when he said: "Brother, when the Utilities District quits selling appliances, we will take them like Grant took Richmond . . . only a lot quicker."

Many private electric companies do not sell *major* electric appliances directly, although all of them do sell smaller appliances at retail. This policy was adopted not because it permitted more economic and efficient operation of an electric utility . . . the contrary is true. It was adopted reluctantly by private electric utilities *because of fear of public ownership.* The friction created by competitive selling by the electric utility with private merchants was regarded as dangerous by the private utility, and many companies ceased selling because they feared such friction might eventually result in a movement for public ownership, supported by retail merchants who resented the selling activities of the electric utility.

The management of private electric utilities will tell you in confidence that they do not favor a non-selling policy and believe it economically inefficient and bad, in the long run, for the utility and for the people. Many are contemplating a return to selling and merchandising, despite the ever-present threat of public ownership.

We do not have to go far for an example of a limited merchandising policy and its origin. The Nebraska Power Co. ceased direct selling of major appliances for only one reason: fear of public ownership. This policy was begun in 1935 and gradually extended until at the end of the war the company ceased all merchandising of heavy appliances. As a substitute it embarked on an expensive program of cooperation and subsidy with private dealers, which included a vast amount of promotion and advertising. The Omaha Public Power District inherited this policy from the Nebraska Power Co. and is, for the time being at least, adhering to it.

Efforts have been made in Nebraska, as well as other states, to prohibit or limit the sale of appliances by utilities, both gas and electric. Nebraska Power opposed the anti-merchandising legislation in the Nebraska legislature some years ago, as did other utilities. This bill was defeated, largely due to utility efforts.

Rarely does a gas company completely relinquish active selling of gas appliances. Historically it has been deemed absolutely essential that the gas utility make available the commoner appliances to its customers, particularly ranges, water heaters, and refrigerators,

WHY THE DEALER CAN'T DO THE WHOLE JOB

(1) *His only interest is in profit.* He is not interested in the economical distribution of gas or its problems.

(2) *His loyalty is divided.* Most dealers must sell competitive electric appliances right along with gas. He cannot recommend gas without reflecting on his own electric merchandise. As a result, he does not *sell;* he lets the customer make the choice. More often, because of a greater profit margin, or because of greater subsidy, ease of installation, etc., he will recommend electric equipment.

(3) *He doesn't have the money, the knowledge, or the expert ability* to advertise and promote the appliance as a gas-consuming appliance. He sells it only as a piece of merchandise.

(4) *Service is a burden.* He is impatient with service problems, and his interest wanes immediately the sale is made. He has little or no responsibility for the successful, safe operation of the appliance, and expects the utility to take this responsibility, even though the utility may have no control over the appliance or its installation.

(5) *Installation is a problem.* The dealer has installation troubles with gas appliances not common to most electric appliances, because of pipe connections, flue facilities, and city regulations. His inclination is to favor electricity over gas, no matter what he tells you verbally.

(6) *Basic attitude is lukewarm.* As a businessman the appliance dealer adheres to the tenets and philosophy of private enterprise. He cannot be expected to be sympathetic toward a publicly owned enterprise or its product, even though on the surface he accepts it and works with it. He cannot help but feel that the Utilities District should not be selling appliances . . . and further, should not be selling gas. Therefore, he cannot be expected to do his best selling job for gas fuel under these circumstances.

(7) *Display, demonstration and general facilities* are inadequate. With few exceptions, the private dealer, because he has so many lines, cannot adequately display merchandise, he cannot carry a full and complete line, he cannot afford to demonstrate the appliance and its use to the best advantage.

(8) *His sales objectives are divided.* Because the average dealer must handle, to make a living, scores and even hundreds of different major items, he has a definitely limited sales ability, particularly with a major appliance which has a complicated and technical application, such as a range, refrigerator, or water heater.

In this part of the country, as well as nationally, gas utilities sell and promote appliances. Peoples Natural Gas Co., the retail distributing subsidiary of Northern Natural Gas, merchandises in the more than 100 towns in which it distributes gas in Kansas, Nebraska, Iowa, South Dakota, and Minnesota. So far as can be determined, all local companies selling gas exclusively on the Northern system merchandise. The Kansas-Nebraska Natural Gas Co. at Hastings merchandises in all its towns.

This pattern is true in other parts of the country, including the United Gas System, stretching around the Gulf Coast, and with other great pipeline systems.

There is no indication that the gas industry is abandoning its traditional trend of selling and promoting gas appliances, either in this region or elsewhere. There is no convincing precedent in the industry that suggests complete abandonment of selling in Omaha.

In considering the abandonment of direct merchandising it must be borne in mind that profits from appliance sales now pay important items of expense and operation in the gas department, and many of these items would have to be continued even if the District did not sell appliances. Naturally, the expense of these activities would have to be paid out of the general revenues of the gas department if selling were terminated.

For the sake of brevity no attempt will be made to analyze these contributions in detail, but it might be well to highlight them during a typical period.

Gross profit from appliance selling during the 12-month period ending Nov. 30, 1949, was $161,619.52. From this gross profit the sales department was charged with:

Salaries and commissions	$ 39,822.29
Advertising (app. & gen.)	62,701.52
General office quarters (rental)	13,384.96
Customers accounting	8,289.23
Supervision	8,693.22
Demonstration & display	10,657.82
Industrial gas expense & salaries	12,914.82
Other salaries	8,257.14
	$164,721.00

This is a simple summary, but it may be seen that these expenses are for the most part not replaceable and must be continued regardless of merchandising policies. For instance, expenses that would continue, lest the revenue be lost to the District, are interruptible industrial gas selling expense, demonstration and display (including home service), advertising, general office expense, supervision, general accounting (if the District financed dealer sales), etc. These items would represent a charge of approximately $160,000 to be absorbed from gas revenues in 12 months. Furthermore, an additional $125,000 would be necessary for the hiring and supervision of outside salesmen to develop dealer sales, subsidize an appliance dealer association, conduct sales training, special dealer advertising, etc. Viewed generally, it would be a costly experiment and might well develop an increase of $285,000 a year in gas department operations.

Let us assume that the Utilities District quit merchandising and turned the sale of the three major appliances over to dealers.

Judging from experience of the industry, the sequence of events shown on p. 50 (see "What happens when a utility quits selling") would take place.

Now this can happen in Omaha, as it has elsewhere. In fact, the above program almost exactly parallels the present situation of the Omaha Public Power District. So it *has* happened in Omaha. Even if the gas dealers did not demand the program, the District would have to do it to save itself from electric competition. The only alternative would be to go back into merchandising.

What would such a program cost the District? The minimum would be $285,000 a year. It might require as much as $350,000 a year. In order to preserve the advertising, merchandising and selling pressure for gas in Omaha such a program would be *absolutely essential* under an exclusively dealer sales plan.

A similar program at the Omaha Public Power District is costing, according to public annual statements, about $475,000 a year . . . and if all costs were shown, we suspect it would be considerably more.

This is what the gas appliance dealers are actually asking the Utilities District to do when they ask that the District go out of the appliance merchandising business.

The only alternative to this program is to let the business go—over a period of a few years—to the District's electric competitor. When the District loses its so-called "kitchen load," it loses the most lucrative part of its revenues. This means higher gas rates that result from uneconomic operation of the system.

In 1930 the Kansas legislature, at the insistence of private appliance dealers, enacted a bill prohibiting gas and electric utilities from merchandising. The utilities of the state, after a brief experience with the law, obtained an injunction and in 1932 the law was declared unconstitutional by the State of Kansas Supreme Court. As elsewhere, prohibition of utility merchandising resulted in a decrease in the *total* sale of appliances and increased the relative promotional expense of the utility, which had to be paid by the gas and electric users.

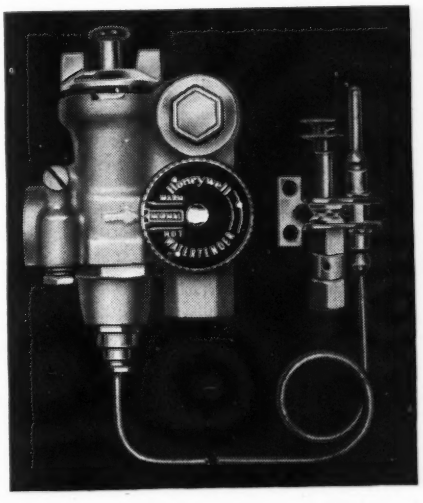
At present, all exclusive gas companies we know of in Kansas are mer-

We doubt that many owls—wise as they are—know Honeywell so well.

But practically every human being knows Honeywell—both the public and the trade!

And what they know is that there's no better guarantee of dependable, trouble-free operation than the Honeywell name on gas water heater controls and automatic pilots.

So—let the Honeywell line help sell your line. For full information write today to: Appliance Controls Division, Minneapolis-Honeywell Regulator Company, Dept. GS-5-81, 8775 Mettler Street, Los Angeles 3, California.



Honeywell's model T-5 "Watertender" is the ideal combination control. It incorporates in one unit a main gas cock, with pilot position, pilot adjustment screw, flow regulating valve, thermostat, and thermomagnetic pilot featuring 100% shut off in all positions.

MINNEAPOLIS **Honeywell** • APPLIANCE CONTROLS

chandising. Some electric companies do not, but this policy is substantiated by a fear of public ownership as well as various franchise difficulties being experienced by electric utilities.

A leading Kansas electric and gas utility executive (his name cannot be given at his own request) whose company does not merchandise said: "*If we had it to do over again we would certainly have continued aggressive merchandising. It was a sad mistake to quit.* As it is, we have to do all the selling, servicing and promotion at great expense to the users of gas and electricity, and a group of appliance dealers get the gravy. We are seriously thinking of going back into merchandising in many of our smaller towns, regardless of policy considerations, and in the next couple of years begin in the large towns."

In the state of Oklahoma the sale of appliances by utilities is at present prohibited by law. In a recent statement, Louis Ruthenburg, chairman of the board of Servel Inc., said: "Extended studies indicate that the total sale of appliances in Oklahoma is greatly reduced because of this restriction. . .

"It follows, therefore, that Oklahoma utilities do not operate at a maximum of efficiency because of limited sale of appliances; and, in the final analysis, the customers of those utilities pay the bill for lower utility efficiency."

Examination of the sale of gas refrigerators in comparable markets to Omaha under various merchandising arrangements are interesting. (See "The dealer wasn't doing the whole job.")

Some of many pertinent reasons (taken from experience) why the dealer *alone* just can't do a completely satisfactory job from the utility viewpoint are shown on p. 48 (see "Why the dealer *can't* do the whole job").

These are *typical weaknesses* of a strictly dealer setup for the sale of gas appliances. There are others, but these will demonstrate why the dealers, without aggressive merchandising, sales, and advertising assistance from the gas utility cannot do the job. *These facts are not stated critically,* because the dealer cannot be expected to do the whole job, and experience proves he can't.

The statement has been made that the District is competing with private enterprise in selling gas appliances. This is so, but is an unavoidable conflict incident to the operation of a public corporation. If it is wrong to compete with private enterprise by selling gas appliances, then it is wrong to compete with private enterprise by selling gas, because gas competes with privately produced fuels in all fields, principally coal and oil. If we adopt the premise that the District should not compete with private enterprise, then the District should sell its properties and go out of the gas business.

It is generally recognized by business economists that promotion and advertising actually cost the consumer nothing. On the contrary, by increasing the consumption of a product, through advertising and promotion, the cost to the consumer is actually reduced.

The whole system of American business is built on mass production. It is through mass production that the unit price of a product can be reduced to a place where a large number of people may enjoy it. Mass production is impossible, in a democracy, except through wide distribution and acceptance of a product. This acceptance can only be built economically through sales and advertising effort.

This same basic principle of business applies to gas service, even more emphatically than it does to many types of enterprises.

The Utilities District's investment in promotion has paid big dividends to Omaha gas users in the form of consistently lower rates and improved service.

There are other savings as well. For example, the District introduced the gas refrigerator into Omaha, and has promoted it consistently for some years. As a result there are more than 8000 gas refrigerators in use in the city today. Operating costs of the gas refrigerator average about $12 per year, compared with more than twice this amount for other forms of automatic refrigerators. By introducing and promoting the gas refrigerator, the District has brought an annual saving of some $96,000 to these gas refrigerator users in fuel costs alone. And, of course, the number of gas refrigerators is growing at the rate of 1000 each year, so these savings will increase as time goes on.

The same comparisons could be made for cooking and for water heating. Actually the users' savings in fuel costs run into millions annually. Public education through selling, advertising and promotion is responsible.

What Omaha has to pay for gas does not depend alone on how much gas the city uses or how efficiently it is distributed. A lot depends on *when and for what purpose* the gas is used.

For example, if customers used gas only for heating their homes, gas rates would be doubled or trebled. It would mean that Omaha's great gas distribution system would be practically idle seven months out of the year, with no income to meet expenses. It would also mean that the gas purchased by the Utilities District from the pipeline company supplying the city would cost a great deal more.

At present, the Utilities District is operating on an annual load factor of

WHAT HAPPENS WHEN A UTILITY QUITS SELLING?

Step 1. The total volume of the sale of gas appliances would drop off, sharply at first, then assume a gradual trend downward. If experience is any guide, the total number of appliances sold would drop to less units than were formerly sold by the dealers alone, due to lack of promotional advertising and sales effort by the utility.

Step 2. Meanwhile, the Utilities District would have lost a great deal of revenue derived from the profit from sales of appliances, which money is now devoted to advertising, promotion, home service, supervisory expenses, sales department rentals, interruptible gas promotion and many other items, paid completely or in large part by the revenues from merchandising. In 1949 this contribution from retail sales amounted to approximately $160,000. If these activities (which are necessary whether the District sells or not) were continued, *this $160,000 would have to come out of the general revenues of the gas department and thus become a burden on those who use gas (rate payers) rather than on those who buy appliances.*

Step 3. At this stage, both the dealers and the District would be alarmed at the situation and the dealers historically will approach the District and ask for the following:

a. The District would be asked to put out a crew of 25 to 50 sales and service people to develop sales of gas appliances, which leads and orders would be turned over to dealers for installation and sale.

b. The District would be asked to contribute a substantial amount of money, probably $15,000 or more annually to the equipment of an office, a secretary and various other expenses of the association, since the dealers feel that the utility is selling the gas and getting the gas profit, so the utility should cooperate with them in organizational subsidy.

c. The District would be asked to provide the dealers with an additional advertising fund for newspaper, radio and other forms of advertising, to be run collectively over the name of the dealer's association promoting gas appliances. Considering the Omaha market, this annual advertising bill should be no less than $50,000 to $100,000. The *World-Herald's* rate for this type of advertising is about double the regular local rates now being paid by the District.

d. The District would be asked to intensify its home service and demonstration work, and its collateral services to gas appliance users.

e. The District would be asked to work out a service plan for all appliances installed, relieving the dealer of all responsibility, both for service and installation.

f. The District would be asked to give sales promotional prizes, unit subsidy money for appliances sold by dealers and other rewards.

Step 4. After these developments, the District would be faced with the decision, *like all utilities are faced, once they quit merchandising,* of meeting these demands or going back into the merchandising business again.

Bryant BLUE SEAL...Gives users the water heater features they want

The Bryant *Blue Seal* Gas Water Heater is made to provide the advantages people want: Completely automatic operation . . . dependability . . . *plenty* of hot water . . . fast, easy temperature selection . . . cleanliness and economy . . . cathodic tank protection.

And beyond these purely operational features is *built-in* Bryant quality that makes for greater customer acceptance and satisfaction. From the extra-heavy tank to the gleaming, easy-to-clean jacket, the *Blue Seal* meets standards far higher than any existing requirements for gas water heater construction.

That's why Bryant *Blue Seal* Water Heaters are backed with greatest confidence by the Bryant 10-Year Protection Plan. That's why your customers ask for the Bryant *Blue Seal* . . . why you can count on gas economy and a minimum of service with this great water heater on your lines.

For complete details, contact the Bryant Distributor near you or write direct. Bryant Heater Division, Dept. 284, Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, O.

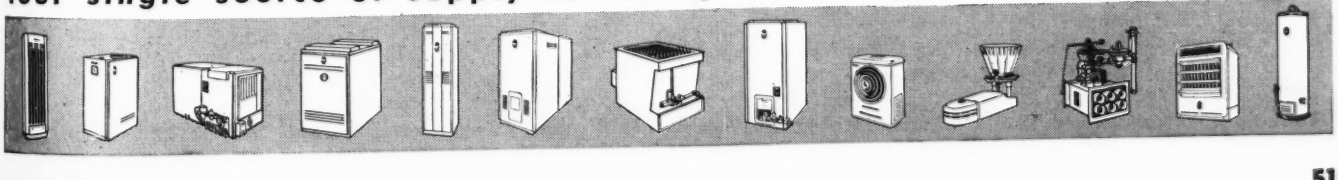
Bryant Model 115 *Blue Seal* Automatic Gas Water Heater. Made in 20, 30, 40 and 50-gallon capacities. Features Grayson *Unitrol* with 100% Safety Pilot; extra-thick *Fiberglas* insulation; exclusive *Link-Trap* segmental baffle; exclusive streamlined downdraft diverter; sturdy one-piece steel base; exclusive porcelain-enameled aeration plate; cast iron burner with raised, drilled ports; and the *Protect-O-Rod*, magnesium alloy anode which inhibits rust, adds *years* to life of tank.

Let the pup be furnace man ...and water boy too!

bryant

AUTOMATIC HEATING

Your *single* source of supply for everything in gas heating equipment!



WHAT THE ROCHESTER ANALYSIS DISCLOSED

Service	Net Investment Responsibility	Annual Revenue	Operating Costs	Contributed To Utility Net Earnings
1. Range	$ 77	$ 24	$ 23	$ 1
2. Range and automatic water heating	107	45	37	8
3. Range, automatic water heating, and refrigeration	110	56	43	13
4. Range, automatic water heating, refrigeration, and house heating (basis 7000 degree-days)	277	160	141	19

$3 INVESTMENT BRINGS

$5 ANNUAL PROFIT INCREASE

There are only a few household appliances that use gas, many that use electricity. Therefore, gas utility management should vigorously promote maximum use of all gas-burning appliances.

According to conclusions of the survey, the minimum residential user of gas becomes a deficit customer as increased costs edge up against scheduled rates. The Rochester customer who uses gas only for cooking causes a deficit of one dollar per year to utility net earnings. Usually the gas stove is the first appliance purchased.

When the residential customer purchases a second appliance—usually a water heater—the deficit is converted to an annual net profit of $9.

When the third gas-burning appliance—the gas refrigerator—is added, utility net earnings are increased to $18 annually—exactly doubling the contribution of the first two appliances.

Although the analysis is for manufactured gas in Rochester, it applies broadly to Omaha. The chart shows why it is not good business for a natural gas company to be satisfied with the cooking or the water heating services in the home. The third appliance produces the most spectacular result.

approximately 50%. To maintain this favorable load factor and balance (on which low rates depend) requires a constant effort to install appliances with favorable load factor characteristics so as to offset those having unfavorable load factor.

Is it any wonder, then, that the Utilities District promotes the increased use of gas for cooking, water heating, and refrigeration in order to offset, at least partially, the unfavorable home heating load?

If Omaha is to have gas rates at anywhere near prices people can afford to pay, promotion of appliances is necessary to maintain favorable load factor. If the District were to lose an appreciable portion of its cooking load, for example, *the general gas rate would have to be immediately increased . . . and increased progressively as cooking, water heating and refrigeration loads were lost.*

Higher operating costs, higher material and labor costs, need for extensions, improvements, and replacements—all these emphasize the necessity, not only for holding the business the Utilities District has, but for *increasing this business.* If business is not increased, rates must eventually be higher. To increase revenues, and at the same time keep the load factor favorable, means that new domestic appliances must be added as fast as possible in order to balance gas use.

For example, it is necessary to add the equivalent of 7500 additional automatic water heaters and 2500 additional gas refrigerators for each 1000 additional house heating customers in order to keep the District's load factor at 50%. This additional use and these appliances can only be added through promotion, sales, and advertising effort.

The District's gas customers received twice as much gas service for their dollar in 1949 as they did in 1924. *Increased balanced use brings cheaper service.*

Studies made in Rochester, N.Y. by the Rochester Gas & Electric Corp. and the American Gas Assn. bring out one point not generally recognized.

The home that uses gas *only* for cooking is generally a liability. If the gas water heater is added, this home becomes an acceptable and profitable customer in a modest way: but the addition of a *third appliance* (the gas refrigerator) brings a remarkable increase in his value as a profitable customer of the gas company.

All of this points to the necessity for the Utilities District to merchandise and sell aggressively if it is to operate efficiently.

The mere fact that the Utilities District is a public corporation does not relieve its directors and management of the responsibility of conducting it with the same energy, efficiency, and dispatch that would be expected of a privately owned utility. In fact, the opposite is true. Because it is publicly owned, the District's operators must be especially diligent in protecting and building the people's property, and in providing the type of service the public has a right to expect.

Good business demands that a privately owned utility promote and sell its service and appliances in the interests of a sound financial position, good service, and low rates. Certainly, a publicly owned utility is bound by these same standards.

The Supreme Court of Nebraska, in a decision handed down in 1940 *(Nelson-Johnston & Doudna v. Metropolitan Utilities District No. 871)*, clearly defines the duty of the Utilities District to engage in all good business practices common to the gas utility industry, including the essential duty of selling appliances. Although this point is repeated in the opinion at various places, the following quotations will serve:

> When a municipal corporation engages in a business enterprise which is reasonably necessary to the performance of its public duty or which materially advances it, or even where the enterprise merely affords the public greater convenience in the use of the municipality's facilities, the participation in such an enterprise is, by the weight of authority, held to be a power implied from or incidental to its expressly granted powers. Certainly no private company *could await the initiative of its prospective customers, nor the efforts of others, to sell appliances before doing business. It would have to rely upon its own efforts in this respect. A municipality engaged in the gas business must meet the same problems.*
>
> The sale of gas appliances by the defendant District is intimately connected with and incidental to the sale of gas, and is, therefore, an implied power of such district because *it directly and proximately tends to accomplish the general purpose for which the District was established and operated.*

In its decision, and in its language, the Nebraska Supreme Court plainly states power and responsibility of the Utilities District itself to make appliances available and states repeatedly that the sale of appliances by a gas utility "tends to increase the volume of gas sales and thereby increases the economic efficiency of the corporation."

The overall experience of the gas industry is that a friendly dealer cooperation program, providing for the merchandising, promotion, and sale of appliances by the utility, *plus* cooperative elements with dealers, principally assistance in sales, works out best for all concerned.

The Proof of the Range is in the Cooking

Grace Hartley, FOOD EDITOR OF THE ATLANTA JOURNAL,

recently made a strictly controlled, laboratory test of the performance of a Hardwick Range. "The results are a joy to report," writes Miss Hartley. "The food proved what the precisely maintained temperatures had promised. The cake, baked at 375°, was browned evenly, beautifully, and every inch of the fine texture was the same. Buttermilk biscuits, at 500°, turned out to be light, fluffy and golden brown. And the second slice of the rib roast (at 300°) was just the same as the middle—my favorite 'medium well'."

Cp *Gas has got it!*

YES, BEAUTY IS AS BEAUTY DOES WITH A HARDWICK!

Why pay for extra gadgets when cooking performance actually depends on just three things?

1 **TOPS IN TOP BURNERS** Simmer-Center burners are two flames in one—one for fast boiling and frying, one for keep-boiling and keep-warm heats.

2 **BALANCED HEAT OVEN** No turning or shifting of pans, no peeking. Bake anything and everything perfectly anywhere in the oven.

3 **SMOKELESS BROILER** Live flame assures perfect flavor for all meats, keeps your kitchen clean, smoke-free. Broiler is easy to remove—wash it like a pan.

See your dealer, your gas company, or write to Dept. L-14

for natural, manufactured or LP Gas

Established 1879

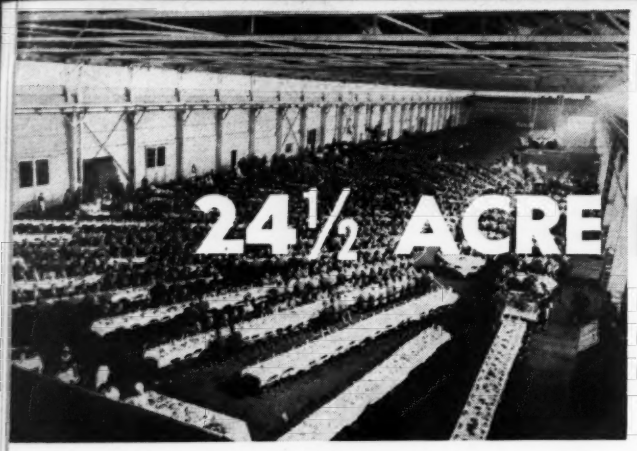
HARDWICK
AUTOMATIC GAS RANGES

HARDWICK STOVE COMPANY — CLEVELAND, TENN.

We "never underestimate the power of a woman" either!

Hardwick continues to tell your customers the story of actual cooking performance, of gas at its best. In the current campaign in national magazines, noted experts in the field of home economics add their authoritative reports—information that will make your sales story more compelling than ever.

Yes, "Never Underestimate the Power of a Woman" is the slogan of the LADIES' HOME JOURNAL, whose ten million readers will see this ad in the May issue.



24½ ACRE HEATING PROBLEM!

At Columbia Steel's Sheet And Tin Mill

THE ABOVE VIEW of Columbia Steel Co.'s tin plate warehouse illustrates its vast area and great height. The warehouse presented only one of the Gargantuan heating problems solved at Columbia. Heaters may be seen at intervals along the wall. Mr. Fallon, who is associated with Dravo Corp., Pittsburgh, relates how each heating requirement was met to produce an efficient heating and ventilating pattern for mill-type structures.

By T. M. FALLON

A three-fold heating and ventilating problem confronting the engineers who designed and built the largest cold reduction sheet and tin plate mill on the west coast was solved by the availability of a heater that conformed closely to their specifications. The "packaged," direct-fired space heaters chosen for these duties are reported as giving satisfactory, economical service with a minimum of maintenance.

Exclusive

The vast, new sheet and tin plate mill at the Pittsburg, Calif. plant of the Columbia Steel Co., a U. S. Steel subsidiary, is modern in every respect. It was dedicated on Oct. 21, 1948, in a ceremony attended by the entire board of directors of U. S. Steel, as well as hundreds of representatives of the press, business, and industry. The overall plant includes basic production open hearths, rolling mills, wire mills, rod mill, and wire rope mill. Other facilities include an emergency hospital, a cafeteria, rest rooms for both men and women, a modern chemical-metallurgical-testing laboratory, and complete storage and maintenance accommodations.

The new sheet and tin mill is a part of U. S. Steel Corp.'s program of addition and improvement, launched since the end of World War II. Occupying 24½ acres of floor space under one roof, the mill building is more than 1600 ft long and 974 ft wide. The machinery contained in this building weighs more than 13,500 tons. The operation of the Pittsburg mill adds approximately 325,000 net tons annually to the supply of flat-rolled steel products made by west coast plants for western industry.

Because Pittsburg is located in an area subject to seasonal temperature changes at the junction of the Sacramento and San Joaquin rivers, 47 miles northeast of San Francisco, the mill's heating demand is somewhat greater in winter than the usual California weather conditions require. To this is added a condensation problem, caused by the precipitation of water droplets on cold metal surfaces from atmospheric moisture held in suspension by warmed air within the mill. Another phase of operating conditions requires removal of fumes from hot dip tinning baths. These conditions necessitate a flexible and efficient heating and ventilating system for this modern mill.

System Requirements

What comprises the flexible, efficient type of heating and ventilating system for this modern mill? Primarily, it must embody certain features that assure the following:

1. Proper distribution of heat in the most economical manner in order to minimize roof loss, eliminate drafts, and direct the heated air stream to where it will best perform the duties for which it is generated, that is, at the working level.
2. Flexibility of application and compactness so that a maximum area may be properly heated with a minimum amount of floor space occupied by each heater.
3. Maximum efficiency in combustion of fuel, and the greatest possible transfer of useful heat to the air stream.
4. Ability to maintain the temperature of a metal storage area at a constant level, in order to avoid condensation of atmospheric moisture on stored tin plate, etc.
5. Economical provision of a dry, warm air supply by reheating and recirculating air drawn from floor level, and the ability to temper fresh air drawn from out-of-doors to replace foul air removed.
6. A stream of air in motion to provide cooling action in summer as well as positive ventilation in winter and in summer.
7. Automatic operation of each heater permitting shutoff when the area served reaches the proper temperature.
8. Simplicity of design and dependability of operation with a minimum of fuel and maintenance expense.
9. Ease of installation, maximum safety in operation, and easy accessibility for servicing and cleaning.

Once these features were recognized as requisites for the entire heating and ventilating system, it was apparent that the system must consist of a number of strategically placed units, due to the vast area served. The heaters were required to heat and ventilate the various sheet and tin plate warehouses, and the areas housing the tin house machine shop, the tin shearing lines, the hot dip tinning units, and the tin plate assorting room, covering almost half the mill area.

Forced Air Heaters Chosen

"Counterflo" forced air space heaters, manufactured by Dravo Corp., were chosen to meet the varied duties required of them.

A total of 32 heaters was installed in various portions of the sheet and tin plate mill—21 heaters with output of 1,250,000 Btu per hour each, and 11 with output of 1,000,000 Btu per hour each. The 21 heaters of 1,250,000-Btu capacity have been in service since the mill was put into operation, and the other 11 were installed in 1949.

All 32 of the heaters are fired by natural gas at a pressure of 5 oz at the burners, reduced from line pressure by regulators. Combustion air is taken from the main supply fans.

Comfort Heating

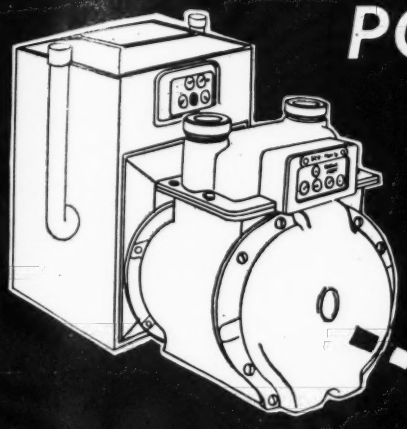
One of the most important functions of any heating and ventilating system is the provision of properly warmed air so that each employee may perform his (or her) various duties in comfort and without lost time.

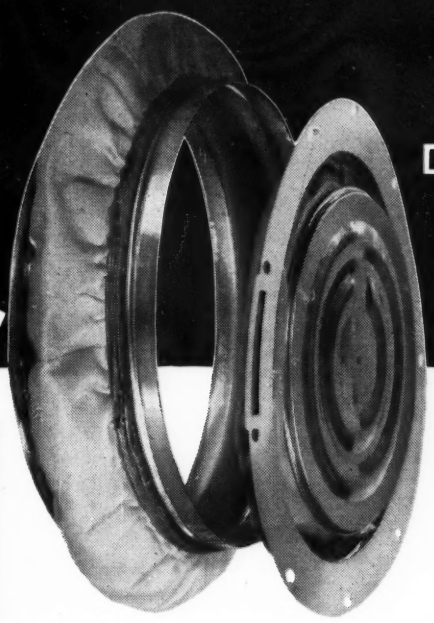
The heaters draw in cool air at floor

Mr. Fallon is associated with Dravo Corp., Pittsburgh, Pa.

POINTS TO REMEMBER

WHEN YOU ORDER DIAPHRAGMS FOR GAS METERS





LANCASTER TIN METER DIAPHRAGMS

LANCASTER METAL RIM DIAPHRAGMS

Improved Type Gas Meter Connection Washers. Made of Neoprene for better sealing against dryness and chemical corrosion, including water and acids. Write for samples.

Lancaster Diaphragm Oil. A special formula diaphragm oil that stays in the leather through a 10 year period. Mediumweight, it does not congeal to excess in winter . . . stays in the leather in hot weather.

Gas Meter Gaskets. Quality made of fine ground high grade cork. Hydraulically pressed before cutting, Lancaster gaskets are exceptionally firm, making them easier to draw down for a tight seal.

Stuffing Box Washers. Tests have shown satisfactory results in eliminating stuffing box leakage by using these stuffing box washers. Write for details and samples.

1. Re-chrome leather is used in all Lancaster Gas Meter Diaphragms . . . the finest grade virgin lamb skin specially tanned for use in either wet or dry gas.
2. Lancaster Metal Rim Diaphragms are made with solid pocket, but leather is *not* wet, blocked, formed or stretched . . . assuring greater pliability and longer wear. No wrinkles or folds around the metal rim . . . no rim or port hole leaks.
3. Improved type center pans in Lancaster Metal Rim Diaphragms are spot welded by special process which eliminates the need for rivets.
4. Both Lancaster Tin Meter and Metal Rim Diaphragms are oiled with LMPCO special formula diaphragm oil which stays in the leather through a 10 year period.

These quality engineering and construction features have been METER-PROVED for over 20 years. They assure you of the sustained accuracy and longer wear you want from the gas meter diaphragms you order.

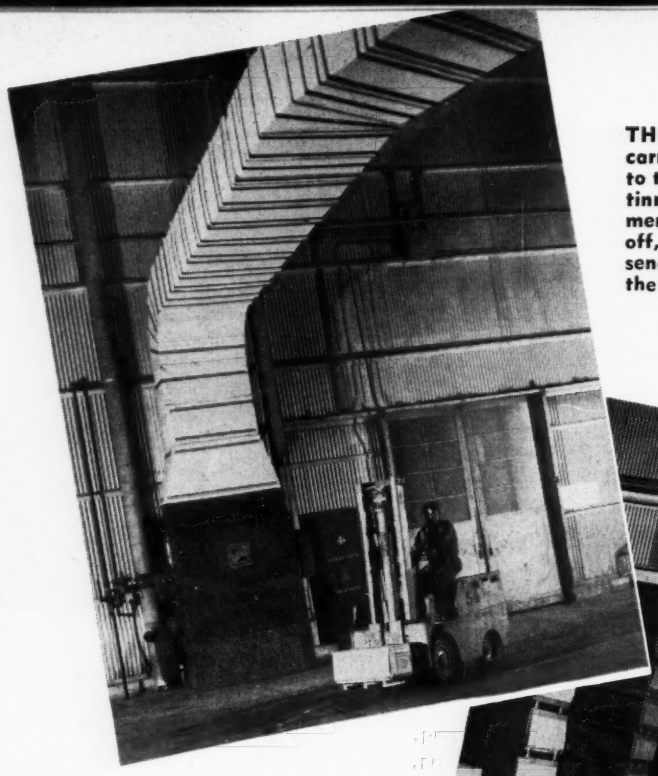
All over the country you'll find thousands of service records that show 10, 15, 20 or more years of continuous service in gas meters for Lancaster Tin Meter and Metal Rim Diaphragms—the best possible proof of superior quality and performance.

Remember these points when you order gas meter diaphragms for replacements and repairs. Be sure to specify the METER-PROVED Lancaster Gas Meter Diaphragm. In the meantime, *write for sample and literature*. There is no obligation.

METAL RIM DIAPHRAGMS

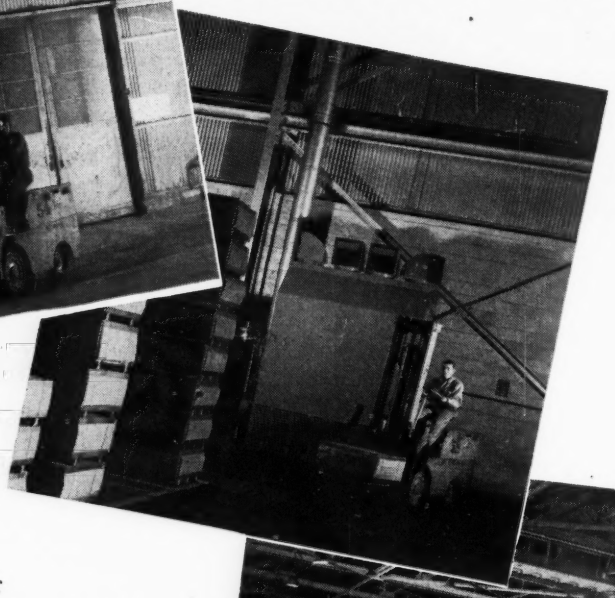
Lancaster METER PARTS CO.

POST OFFICE BOX 378 . . . LANCASTER, OHIO



THIS RECTANGULAR duct carries the warm air stream to the duct over the hot dip tinning machines. In summer, the burner is turned off, and the heater then sends cool, fresh air through the duct.

ONE OF THE warehouse heaters is shown with nozzles releasing the warm air stream in four different directions, so that the entire area is uniformly heated.



BELOW: View showing fume hood and fresh air duct over the tinning machines. Each duct outlet provides each operator with fresh, heated air at all times. The duct, as it extends farther away from the heater, becomes progressively smaller in diameter, assuring uniform distribution of the air stream from all the duct outlets.

level through intake louvers in the lower portion of the casing at the rate of 11,000 cfm per million Btu output, temper it, then circulate it. The air temperature is raised approximately 80°. Then the air is distributed through directional louvered nozzles parallel to the floor, but above the workers' heads, at sufficiently high velocity—2000 fpm—to evenly blanket a large area.

This method of heat distribution produces a uniform temperature at the working level without drafts, and tends to prevent the warm air from rising immediately to the roof, thereby reducing the roof heat loss.

Condensate Control

It is commonly known that warm air can carry more moisture in vapor form than can cold air. When warm air meets a cold body, particularly one of metal, the atmospheric moisture so carried is deposited in the form of droplets of condensate on the cold body. In many a steel warehouse, this condensate has caused trouble by forming rust spots on the stored metal, and steps were taken to eliminate the possibility of this happening at the Pittsburg mill. The engineers knew that this condition could be overcome by holding the temperature of the stored material within certain limits at all times.

To prevent this condensation, nine heaters are installed in the tin plate warehouse, and four each in two sheet warehouses. Certain of the heated air streams are directed downward to heat the floor as well as the material stacked in the immediate vicinity. By the same operation, any droplets of moisture which may have formed on either the floor or the stock are evaporated and carried off by the warm air stream.

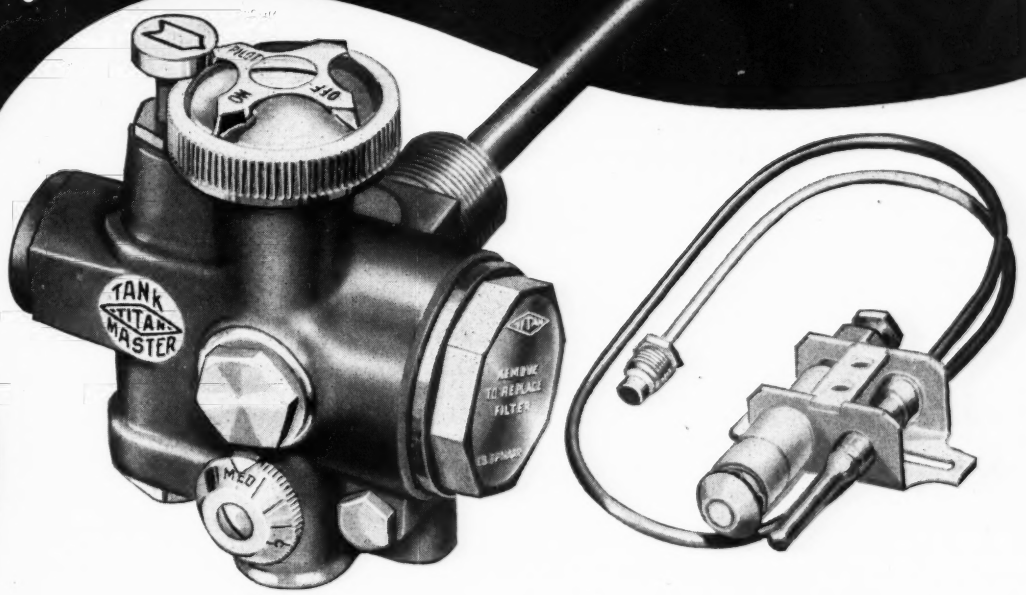
Another example of the extreme care that is taken to avoid condensation of atmospheric moisture is the treatment of box cars which are brought in on the loading track included within the tin plate warehouse. If the outside weather is cold, the cars and the air contained therein are cold when they are first brought into the building. Both the chilled air and the box car material will cause condensate to form from the heated air within the building. Box cars are therefore held on the indoor loading tracks for a period of from 12 to 24 hours before any product is packed into them for shipment to the customer.

Tempering Make-Up Air

A heater near the end wall of the tinning room tempers fresh make-up air drawn from out-of-doors, warms it, and blows it through a duct above the employees' heads. The warm air stream is directed downward by the duct outlets so that each employee in the area is assured of a plentiful supply of fresh air. This duct becomes progressively smaller as it extends farther away from the heating unit, providing a constant, equalized air supply from all outlets.

In the summertime, the burners are turned off, and the units are used to circulate fresh air in exactly the same manner in which the heated air is distributed in the winter.

Tankmaster



An *Improved* Water Heater Control...

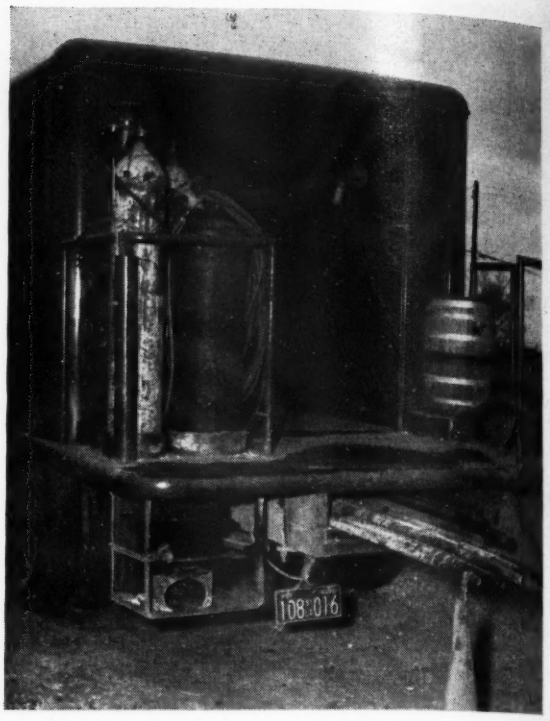
MANY NEW FEATURES GUARANTEE GREATER EFFICIENCY!

- **Larger Filter—a decided advantage—easily removed for replacement.**
- **Larger Capacity—61,500 B. T. U.—AGA Listed.**
- **Designed for use with all gases.**
- **Metal to metal valve and seat for all gases.**
- **Has Improved Titan Snap Action Mechanism.**
- **Safe Lighting—Main burner must be off before pilot will light.**
- **100% Safety Pilot—Gas shuts off if pilot light goes out.**
- **Higher operating efficiency.**
- **Milwaukee Gas Power Unit is replaceable, can be taken out without removing control from tank.**

The Titan Tankmaster will be manufactured in as large quantities as possible, depending upon the material situation.

THE TITAN VALVE & MANUFACTURING COMPANY

9913 ELK AVENUE • CLEVELAND 8, OHIO



REAR VIEW shows underslung pipe rack which holds 21-ft. lengths. Beneath water keg is access for tubing which holds pipe when it is being threaded or cut. Pipe vise is out of picture at right.

LOUISIANA POWER BUILDS A VERSATILE GAS TRUCK

By W. H. CABRERA

NUMEROUS problems, some of them conflicting, had to be solved in devising a truck to fit every need of Louisiana Power & Light Co.'s West Bank gas department. Combining a body, custom built by Blattmann Sheet Metal Works, and a Ford F-5 cab and chassis, we have fashioned a truck which meets our exacting requirements.

The first requirement was that it be a light construction truck with as short a wheel base as possible in order to give it maneuverability. On the other hand, however, the body had to be long enough to accommodate lengths of 21-ft pipe in size varying from ¾-in. to 4-in. Also the pipe load had to be located where it would be evenly distributed between the two rear springs.

Another requirement was that no tools or supplies be carried loose in the body since they constitute an accident hazard; and further, that all supplies of a messy nature such as pipeline enamel, kerosene, prime paint, lubricating oil, etc., be carried below the deck in order to reduce the work of keeping the truck clean.

It was necessary to build the deck high enough off the ground so that tool boxes could be located beneath it and also low enough so that pipe held in the vise would not be difficult to thread.

With these requirements in mind we set to work to design the body.

A sub floor of sheet steel was welded directly to the chassis and, after cutting out a section of the rear of the cab, was extended 2 ft. 6 in. toward the front beneath the driver's seat. After the body was installed, the two sills rested along the sides of this sub floor forming a compartment 2 ft 7 in. wide, 6 in. high and 17 ft 8 in. long. This compartment is capable of carrying 54 lengths of 1-in. pipe, 22 lengths of 2-in. pipe, eight lengths of 3-in. pipe or 6 lengths of 4-in. pipe. The unsupported pipe overhang at the rear of the truck is 3 ft, 4 in.

After designing the numerous tool boxes, we came to the conclusion that we could not get by with less than six, two of which had to be located below the deck forward of the rear wheels. An additional box was also installed inside the body at the front end and is used only for rubber boots and raincoats.

The side boxes above the deck serve as seats for the crew members and the ones on the right side of the truck have false bottoms in order to accommodate a length of 3½-in. tubing which runs the length of the body. The purpose of this tubing is to accommodate a length of pipe held in the vise for threading or cutting.

The sides, top and front end of the body are constructed of sheet steel riveted to a steel framework.

The oxygen and acetylene drums are carried on the rear deck in the customary steel rings. However, each one is individually supported at the upper end by a combination spring and chain attached to the railing. The same method was used to secure the water keg.

In order to lengthen the life of the truck it was completely undercoated below the deck, as were the interior sides and top and the tool boxes.

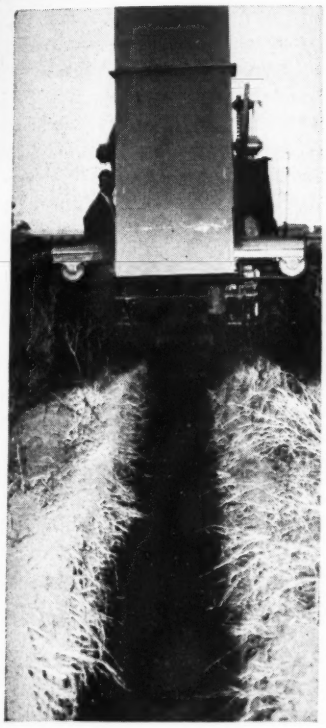
The design and construction of this truck were made possible by the combined efforts and suggestions of A. W. Durning, A. C. Ellenburg, Werner Blattmann and members of West Bank Gas Construction.

Side view of Louisiana Power & Light's new gas truck.

THE WORLD'S FASTEST MOBILE DITCHER!

PEWTHERS "EARTHRIPPER"

Digs Two City Blocks in One Hour



Pewther's EARTHRIPPER is particularly suited for gas lines, extensions and house-to-street service lines. Any small ditching job . . . in the oil fields . . . on contruction jobs . . . for utility ditching that requires ditches 10", 14", or 18" wide . . . is duck soup for this new, *different* Pewthers ditcher. The EARTHRIPPER tears though any kind of soil . . . from sand to "Texas gumbo" . . . at a maximum depth of 5 feet at the rate of 20 feet a minute!

If you look out over a field or a real estate project and think you see a Ford truck digging ditches, don't hurry to an oculist. It's probable that you are gazing at the latest development in ditchers for gas, water, cross-country pipe lines and the laying of telephone cables and conduits. While most ditchers are of the tractor type, this innovation in digging equipment has been standardized to Ford trucks. This new ditcher offers the man who has small ditching problems just what he needs—fast, efficient, *economical* digging.

ECONOMICAL The EARTHRIPPER, fastest mobile ditcher in the world, saves time and money through reduced labor and maintenance costs. One man can handle your ditching problem, from driving the truck to the ditch site to lowering the boom and opening the earth at the rate of twenty feet a minute! Built for hard use and daily operation, the EARTHRIPPER has low maintenance costs because of standardization of automotive parts.

EFFICIENT New and unique in design, the EARTHRIPPER is the first ditcher to be attached to a truck. Its boom and bucket line eliminate the necessity for great weight, for the harder the digging, the greater the pull on the machine to the ground. Thus the new Pewthers ditcher tunnels under and literally "rips" out the earth, shaving the ditch sides close and leaving the bottom smooth and clean. Centrifugal force keeps the teeth clean of mud and packed dirt.

VERSATILE The Pewthers EARTHRIPPER digs vertical ditches on any kind of terrain under almost any digging condition. On slopes the truck and tires follow the contour of the ground; the digging equipment remains vertical for straight, clean ditching. The EARTHRIPPER is versatile because it is mobile. On the highway its speed is the speed of the truck. The raised boom clears telephone wires and tree branches making transit easy and speedy, even in heavy city traffic.

PEWTHERS DITCHERS COMPANY • 3530 Mansfield Road
Shreveport, Louisiana

Send for the folder on the new Pewthers ditcher, the EARTHRIPPER. Learn for yourself how the EARTHRIPPER can save time and money on any small ditching job! Ask for a demonstration before purchase . . . at any point in the United States!

NAME_____ TITLE_____

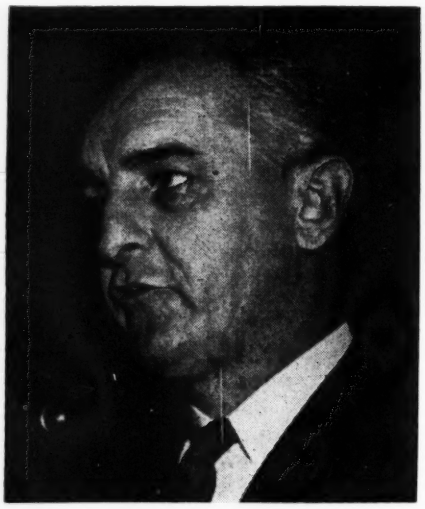
COMPANY_____

ADDRESS_____

PEWTHERS DITCHER COMPANY

3530 MANSFIELD ROAD • SHREVEPORT, LOUISIANA

Role of Public Relations During A Conversion



By W. P. WOODS

President, Conversions & Surveys Inc.
New York

THE conversion job is a job of cooperation—on the part of the utility, the public, and the conversion contractor. If any one of these three fails to cooperate, the gas-consuming public is going to suffer and the gas company's public relations will suffer.

There are three main points that the public wants to know about the conversion to natural gas:

What will it cost?
When will they get it?
How will it inconvenience them?

To keep objections on the part of the public to a minimum, the gas company must depend on publicity and educational programs. Information on conversion from manufactured to natural gas should be available to the public prior to the time conversion begins.

There are several booklets available that can be used to inform the public on conversion problems and practices. These should be used or the gas companies should prepare their own. They should deal with:

The story of natural gas.

Description of natural gas—its heat content, etc.

The use of stand-by facilities, peak load necessities, etc.

Why it is necessary to convert appliances.

Information on whether there will be rate reductions; or if present rates will continue, and why.

Information on method of billing—will there be a change (if so, it should be explained).

It is a good idea to give conversion demonstrations to certain groups in order to have the full cooperation of everyone involved. Some of these groups would be:

City officials—such as mayor, engineers, fire chiefs, etc.

Civic organizations.

Church auxiliaries.

Dealers — appliance stores, plumbers, heating contractors, etc.

Use newspapers to publicize conversion. Take them into your confidence and give them details of conversion as early as it seems wise. In this way you can get much free publicity for your program and can lessen criticism by local press and other groups. Be sure to have one company executive designated to release all information of this kind.

Newspapers should be used to prepare the public for conversion. Use large advertisements for this purpose. A map showing areas to be converted at a certain date or dates are very good.

Mail broadsides to all customers explaining what conversion from manufactured to natural gas means, what the problems are, and how they can cooperate in the conversion program. Give them information about dates the conversion is to be made. Keep customers advised at all times what to expect and when.

Employees must be thoroughly trained. Start well in advance of conversion so all employees will know what the company is doing and so they can answer customers' questions intelligently. Servicemen, especially, should have all the answers on natural gas.

Labor negotiations should always be settled in advance of conversion. This will head off labor problems and adverse publicity.

Set up a school for servicemen so they may be trained properly, and plan to use the best servicemen as inspectors of conversion work. This will insure using as many company employees as possible and will help maintain good labor relations.

Conversions are usually made on a 10-hour, six-day week basis. Try to give your own men as much of this type of extra work as possible for otherwise if they see the conversion contractor's men getting this extra work, they will resent it.

Try to develop good understanding between employees of the conversion contractor and gas company men. This is important so that they will be in complete harmony as far as public contacts go.

Switchboard operators should be well trained so they can answer intelligently all questions regarding conversion operation. They should be briefed daily on progress of work and know what section is being converted and what sections will come up next.

It is the conversion contractor's responsibility to order all the necessary material to do the job. He should secure employees who know their job and can work with gas company men.

Personal appearance and character of thes men is important. They must be clean, mannerly, and helpful.

The ordinances of the community should be discussed in full before the conversion in order that all requirements are taken care of by the contractor.

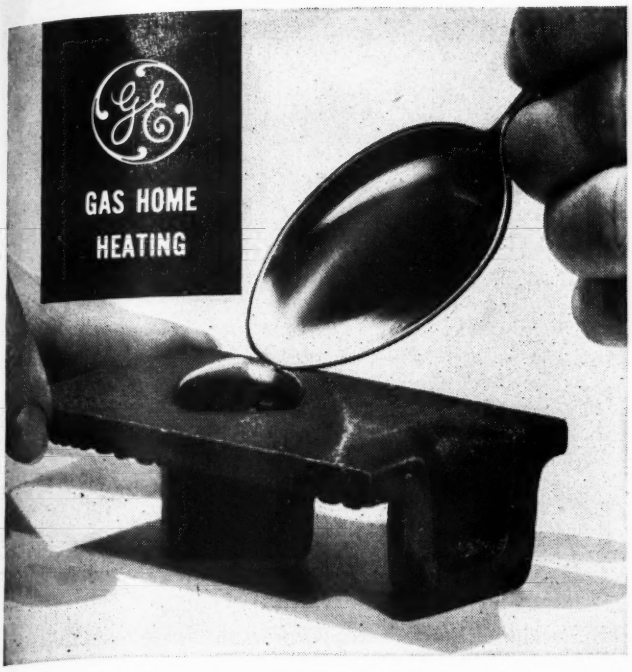
It is usually better if all small claims are handled by a company's own adjustment department. Usually this includes all claims up to $100.

These claims may be numerous, due to the fact that many of the appliances in use are old and difficulties with controls or other parts may be blamed on the conversion. Sometimes the crews themselves are responsible. It is usually better to take care of all of these claims without too much question in order to keep customers happy during the conversion period.

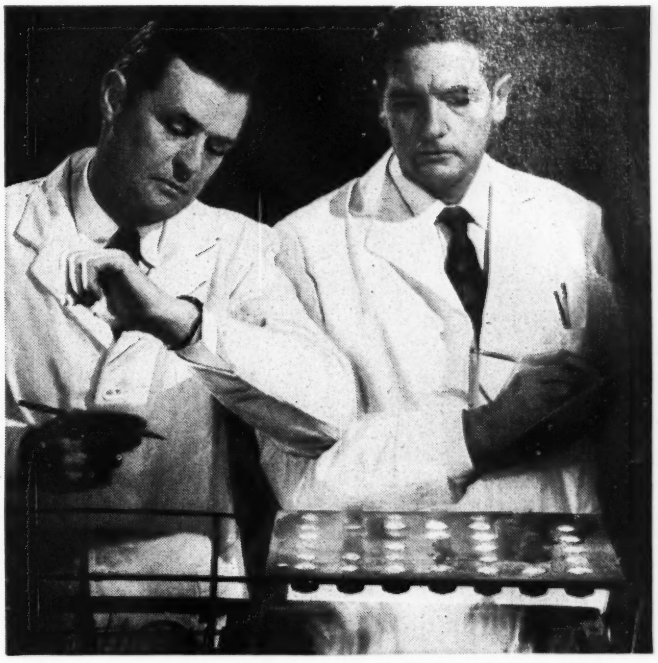
Presented here in condensed form are staff-written versions of the round table presentation made at the New England Gas Assn.'s annual meeting in Boston, March 29-30, on the subject of conversion.

This is the third changeover report to appear in GAS during the past year. For more information on conversion problems and techniques, readers are directed to the May 1950 issue ("What's Your Question?" p. 31) and to the December 1950 issue ("Experts Give Their Views on Ticklish Changeover Problems," p. 25).

Included in the panel discussion was Mr. Woods' paper, which served as an introduction.



Demonstration shows how less than a spoonful of water is contained in each hollow "diamond" of G-E Gas Boiler. Water heats much faster for the same reason spoonful over flame heats quicker than panful.



Engineers demonstrate quick heating achieved by G-E Gas Boiler. Section of cast-iron transfer surface is put on side over flame—each hollow diamond boiler is filled with water. Note projections at bottom.

THE G-E GAS BOILER

Compact, efficient, attractive... designed by General Electric "Climate Engineers" to provide quick, economical heat... an increasingly popular unit for steam, vapor, hot water, or radiant panel heating systems.

More and more owners every day are benefiting from G. E.'s engineering developments—such as the hollow, water-filled, diamond-shaped projections on the heat transfer surface of the G-E Gas Boiler.

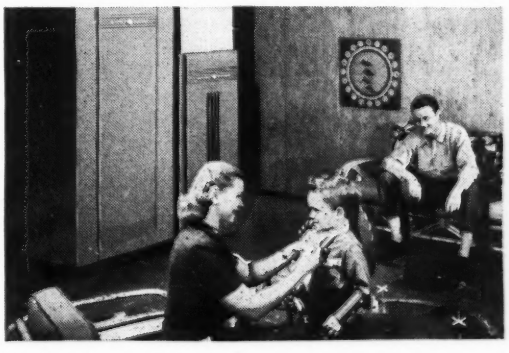
There are literally hundreds of these water-filled cast-iron "diamonds" in every G-E Gas Boiler. Heat is concentrated on them, the water heats faster, the home owner gets heat to the home in minutes—from a cold start. Economical heat, too!

Materials are carefully selected for G-E Gas Boilers. The cast-iron boiler, cast-iron burners with brass orifices, corrosion-resistant finish of the jacket, and factory-built and tested controls assure you that this unit has maximum reliability and long life built in. Eight models—from 96,000 to 432,000 Btu/hr input. General Electric Company, Air Conditioning Department, Bloomfield, N. J.

You can put your confidence in—

GENERAL ELECTRIC

Installation photograph of the G-E Gas Boiler shows its small compact size and attractive appearance.



General Electric also makes gas furnaces for warm air systems and for use with G-E *Air-Wall* Heating. Here the General Electric Gas Furnace (right) is installed with the new G-E Air Conditioner which allows economical year 'round home air conditioning.

MEMBERS OF NEGA'S conversion panel were D. S. Bittinger, Washington (D. C.) Gas Light Co.; L. J. Eck, Minneapolis Gas Co.; H. A. Eddins, Laclede Gas Co., St. Louis; G. G. Howie, Cambridge (Mass.) Gas Light Co.; R. Van Vliet, New York & Richmond Gas Co., Staten Island; and J. T. Wolfe, Consolidated Gas Electric Light & Power Co. of Baltimore.

Roundtable Report On Changeover Tactics

Publicity

MR. EDDINS: General education on conversions should start as early as possible. We have used newspaper ads to show entire distribution systems with time tables for various districts to be converted.

We used special letters—at least two. The first one went out a month ahead of the work, the second one a week ahead.

We also used a handbill at the door of each house, as well as radio spots.

In St. Louis, we called the mayor and other city officials together and showed them the difference in operation of manufactured and natural gas. We made an actual conversion before them to show the problem we faced in each customer's home.

It is important not to run down your present gas because other cities nearby might have to use manufactured gas for some time, and you might have to use it for peak loads.

Price

Rate cases should be settled before conversion begins. Every effort should be made to give the public an honest picture of the new rate structure and any reductions to be effected.

MR. WOLFE: A gas company about to make conversion should adopt a definite basis for billing. It is not necessary to make a billing change, but in any event, you should let the public know.

Don't economize on the publicity budget. At Baltimore the cost for publicity on the conversion was 35 cents per meter, or $110,000.

MR. VAN VLIET: We did not have much time to publicize our conversion program. The most valuable thing we found was the set of movies on natural gas furnished by the AGA. Followed by a short talk, these proved very effective.

Employee Relations

MR. WOLFE: Conversion to natural gas cannot be carried out just by employing good mechanics. It is a job of cooperation by the community as a whole.

Take your employees into your confidence. Your success depends a great deal upon how much they know about your program.

We began with a meeting of our supervisory group, at which time we gave them the complete story on natural gas. This was a whole year before natural gas came. At this time we assured the men that it would bring no layoffs.

We also carried articles on the program each month all year long in the employee magazine.

One month before the conversion was undertaken, we gave out booklets that included most of the answers to problems related to it.

Customer Relations

We felt that we could make a rate reduction of 25%. We announced this before conversion and made the reduction coincident with the conversion of each customer's appliances.

Assume that you will have complaints and be ready for them. You will probably have complaints from 90% of your consumers. We added to our telephone board to service these complaints immediately..

Relations with Officials

We had good relations with public officials in Baltimore. In fact we asked them to help get natural gas, so they felt they were partly responsible for the gas and helped in every way they could. Because of this help, natural gas was brought into Baltimore sooner than it might have been otherwise.

In Baltimore, 355,000 conversions were involved. Because of the widespread publicity given the job, in only 104 cases were crews unable to get into the houses and shut off appliances.

Communications

MR. VAN VLIET: Switchboard facilities have to be ample to care for increased calls that come from conversion. Radiotelephones in service cars will help tremendously.

MR. ECK: You must have enough trunk lines to serve additional calls. We have 100 cars with two-way radio. This is a great benefit to street crews on conversion.

Employee Considerations

MR. BITTINGER: Relations with employees are important. We told our employees why the company needed the conversion crews on the program. Because of this the crews worked together better. In this connection it is best to instruct both outside conversion crews and gas company crews not to comment to the public about each other's work.

The curtailment of men in some departments such as gas manufacturing is necessary. In shifting these men into other departments, we transferred a man's senority with him.

MR. VAN VLIET: We had our men work extra hours so they would feel they were getting their share of the conversion work.

MR. WOLFE: Our employees were assured there would be no layoffs because of conversion.

Servicing

MR. ECK: During conversion we used our regular servicemen. All were trained before and we gave them as many hours as the conversion crew. We worked them six days a week.

After conversion our complaints were 10% lower because our appliance problem had been eased.

MR. EDDINS: You can cut down conversion time by having a special crew on refrigeration. We did this with success.

MR. BITTINGER: You will have many service complaints and many leak complaints.

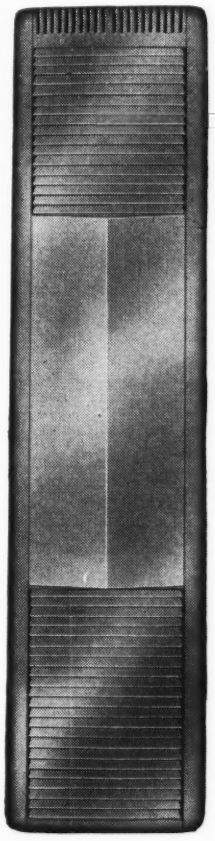
EMPIRE GAS APPLIANCES

ECONOMICAL

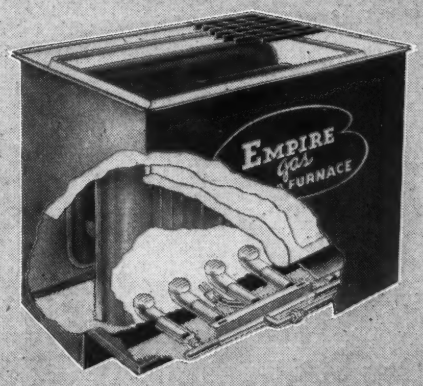
EFFICIENT

RECESSED HEATING SYSTEM

Dealers everywhere are setting the pace in sales with the new Empire Recessed Heating System. Complete control of individual room temperatures can be maintained by multiple installations, utilizing automatic controls.



EMPIRE GAS FLOOR FURNACES



Recommended by thousands upon thousands of users throughout the U. S., Empire Gas Floor Furnaces are equipped with the famed Thriftmatic Gas Burner. Provide greater economy, less dirt, and trouble free service.

AGA APPROVED

EMPIRE GAS RANGES

A gas range for every need! Empire's complete line of gas ranges is designed to meet each of your customers individual needs. Glide out broilers, single or double ovens, 4 or 6 burners, visual doors, oversize ovens and many other modern features to provide volume sales, and higher customer satisfaction.

EMPIRE STOVE COMPANY

BELLEVILLE, ILLINOIS

WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

ASSOCIATIONS

March Reports

New Englanders Emphasize Conversion Problems

With every element in the packed but well-balanced program focused on conversion to natural gas, a record turnout of 815 attended the silver anniversary meeting of the New England Gas Assn. March 29-30 in Boston. Registration topped the previous high by 26%.

Gas industry men from many other sections of the country joined the members from the six New England states to make the meeting one of the most successful in association history. Those from outside the association's realm came both to teach and to learn—to teach from their own experiences the opportunities and problems of conversion and to learn more about the anticipated growth of the industry in the Northeast.

Of topmost interest during the four sessions was a panel discussion on conversion to natural gas, presided over by G. G. Howie of Cambridge Gas Light Co., vice president of the association, and participated in by D. S. Bittinger, Washington Gas Light Co.; L. J. Eck, Minneapolis Gas; H. A. Eddins, Laclede Gas, St. Louis; Rutherford Van Vliet, New York & Richmond Gas, Staten Island; and J. T. Wolfe, Consolidated Gas, Baltimore.

A resume of the panel's discussion appears elsewhere in this issue.

A talented lineup graced the rostrum during the entire meeting. Clark Belden, managing director; F. O. Hess, president of Selas Corp. and GAMA; J. A. Hiller, NEGA president from Portland, Maine; AGA President D. A. Hulcy from Dallas; W. P. Woods, Conversions & Surveys, New York; Hall M. Henry, Cambridge; W. R. Fraser, Michigan Consolidated, Detroit; Irving K. Peck, Manufacturers Light, Pittsburgh; W. L. Hayes, Montana-Dakota Utilities, Minneapolis; W. G. Barlow, Opinion Research Corp., Princeton, N.J.; J. French Robinson, East Ohio, Cleveland; and D. V. Brown of Massachusetts Institute of Technology.

An added attraction was the home service luncheon presided over by Ella A. Heyne, Northampton (Mass.) Gas Light, at which Mr. Hayes told why "I Believe in Home Service."

Challenges and opportunities which natural gas presents ran as a theme through the sessions. One of the most articulate of the speakers was F. O. Hess, whose talk appears elsewhere in this issue. His remarks were followed on the sales level by the remarks of Mr. Peck, who outlined a sensible natural gas sales program.

Mr. Hayes, a disciple of the doorbell-ringing school, made a strong appeal for direct merchandising by utilities in a speech similar to the one he presented before the AGA convention last October, and which by popular demand he was scheduled to deliver at the Southern Gas Assn. convention late last month.

Our markets will be lost if we continue to keep hands off merchandising during the emergency period, he said. Big name electrical appliance manufacturers, pocketing fat defense contracts, will have adequate money to spend on promoting their equipment for the post-emergency market. This is a threat that must be met.

In 1949, less than 3000 full-time salesmen were working in the gas industry, and the competitive results have shown it, he declared. "Our solution is good, old-fashioned door-to-door salesmen. This is the only answer," he said.

In terms of dealer relations, he pointed out that there is evidence that dealers will sell more instead of less gas appliances if a gas company aggressively sells and promotes appliances in its territory.

Mr. Hulcy, who confidently titled his paper "The Sky Is the Limit," pointed to the amazing reversal in the gas trend in the past 15 years since national coordination was put to work to pull the industry out of the doldrums.

"In 1935-36, public figures went out of their way to call us moribund," he said. "New York's Mayor LaGuardia said the next generation would have to go to a museum to see a gas range. Roger Babson observed that the long-term future of the gas business was so bad as to warrant liquidation of its senior securities. . . . Gas was in the doldrums."

What happened? Many things, among which were the conception of a national cooperative advertising campaign started in 1935 to glamorize the use of gas in the home, which has since been supported with an aggregate outlay of $8 million; the inception of PAR, which "doubled the amount of funds spent for national advertising, multiplied the cooperative AGA research program, quadrupled national promotional activities"; the national awakening to the march of gas to new areas; the tremendous outlays for expansion; and VIC (venting, ignition, and combustion), the young research project which promises to open new fields of utilization.

"Interplay of Strong Forces" was the title of outgoing president J. A. Hiller's talk. The strong forces mentioned were:

1. Natural gas for New England, which demands large changes in operating procedures in all phases of the business,

2. The military emergency, which may bar New England from getting natural gas soon because of attendant materials shortages,

3. Public relations problems which will be posed by conversion, and which may be affected by the emergency with its higher living costs, material shortages, and personnel shortages,

4. Personnel, which has been squeezed through rapid expansion, and which affects and is affected by the other factors.

These have further inter-relationship with six current trends—the further growth of output, the continued move toward higher Btu gases, the increased use of LP-Gas for supplementing base gases, the progress of catalytic cracking, the growing shortage of appliances, and the tightening of the spread on net profits.

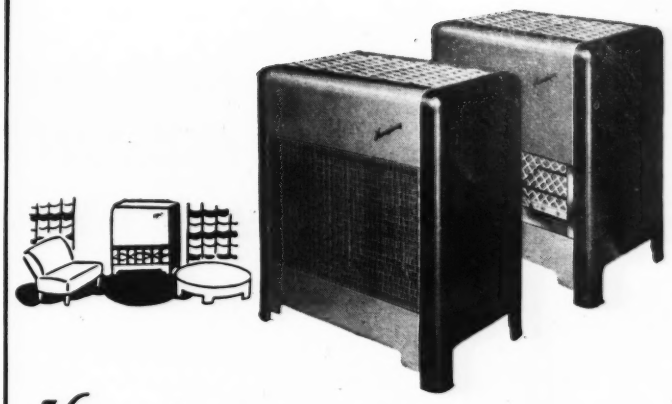
"Trying to secure our steel requirements is a big job," said Hall M. Henry in his re-

NEWLY ELECTED officers of the New England Gas Assn., elected at the annual meeting March 29-30, include (front row, from left) Gordon G. Howie, Cambridge Gas Light Co., incoming president; John A. Hiller, Portland Gas Light Co., retiring president; Sherman R. Knapp, The Connecticut Light & Power Co., Hartford, first vice president; (rear) Jesse L. Johnson, Providence Gas Co., second vice president; Earl H. Eacker, Boston Consolidated Gas Co., chairman, nominating committee; Otto Price, Boston Consolidated Gas Co., treasurer; Clark Belden, managing director, clerk.

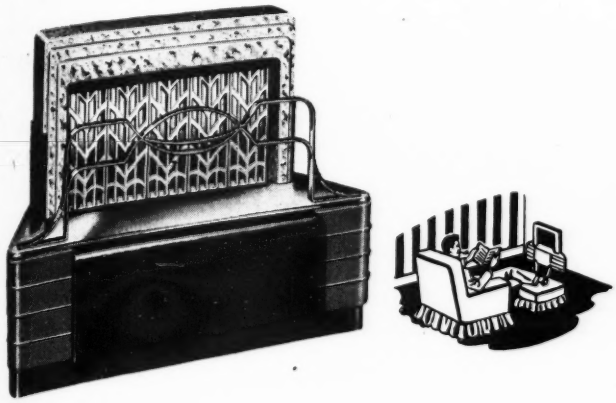
THE *Humphrey* LINE

...GAS HEATING AT ITS BEST!

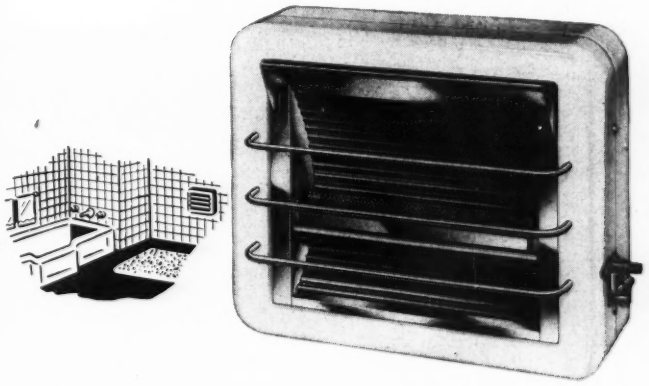
You can sell Humphrey Gas Heating equipment with confidence that you are giving your customers complete satisfaction in styling, heating performance, and economical operation.



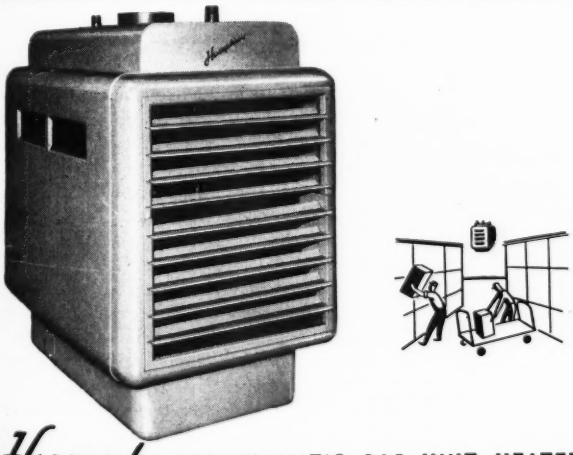
Humphrey **CIRCULATORS** Unsurpassed in ability to produce fast, clean heat . . . modern, beautiful styling . . . low cost operation. Two models . . . Open front Radiantfire Circulators and Closed front Royaline Circulators. Manual or automatic operation.



Humphrey **RADIANTFIRES** One of the most popular gas heaters ever made . . . abundant, satisfying heat with all the cheerfulness of an open fire. Available in vented and unvented models . . . manual or automatic operation.



Humphrey **WALL HEATERS** Ideal for bathroom, sunroom, den, playroom and many other places where economical auxiliary heat is needed. Designed for your choice of mounting — recessed in the wall or mounted on the wall. Easy to install.



Humphrey **AUTOMATIC GAS UNIT HEATERS** Completely "packaged" circulated heat for stores, shops, restaurants, garages, factories, etc. No boiler room equipment or fuel storage. Exclusive Humphrey construction assures maximum heat output at lowest fuel cost. A size for every need.

There is no substitute for experience. For more than fifty years we have been designing and building gas heating equipment *exclusively* . . . that is why there is no finer line of gas heating equipment made.

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RIGHT! AND IT'S A HONEYWELL DEVELOPMENT-JUST AS YOU'D EXPECT!
MINNEAPOLIS
Honeywell
First in Controls

port on this phase of defense problems. Production of line pipe has dropped 40%, he said, which will result in the failure of a good deal of the pipe scheduled to be delivered this year to actually reach the buyer.

Under federal regulations, priority consideration will be given to such factors as use of gas to save oil supplies, war production needs, and any other activity essential to the defense effort.

Natural gas in the Northeast would save 22 million barrels of oil per year, Mr. Henry estimated. That's a fact that should be stressed in applying for steel, he said.

Accelerated growth of the association over the past five years was emphasized in the annual report of Managing Director Clark Belden. During the period, NEGA enjoyed an increase in membership unequalled in its 25-year history.

A few of the figures cited: At the close of the 1945-46 year, there were 194 company members; now there are 300, an increase of 54½%; at the same time, individual memberships were jumping from 807 to 1201, a gain of 49%; of the memberships added, 88% were in the manufacturers division.

The explanation lies partly in the recognition of NEGA's importance in the gas industry.

Augmented activity of the sections in the form of conferences held was also reflected in statistics which Mr. Belden quoted at length.

425 at Oklahoma Meet

"The way to make our employees more loyal, better satisfied, and boosters for the American way of life and opponents of those who seek to destroy it is to take them into our confidence, tell them of our policies and problems and future plans," said F. W. Peters, vice president and treasurer, Oklahoma Natural Gas Co., speaking before the 33rd annual convention of the Oklahoma Utilities Assn. in Tulsa March 29-30.

"If we give employees more facts about their present jobs and how they can qualify themselves for better jobs, and tell them about job security and what will happen to them under retirement, we can satisfy them that the company they work for does look after their interests and that the system it operates under is the best in the world."

More than 325 persons registered at the convention and 425 attended the annual banquet. This registration was said to be the largest attained by the group. C. N. Robinson, vice president, Public Service Co. of Oklahoma, and president of the association, presided over the meetings.

Oscar Monrad, vice president of the First National Bank & Trust Co. of Oklahoma City, urged the utility men to "sell" the state along with their utility services. Jack Bruyn, young engineer of Public Service Co. of Oklahoma, told "why" he joined a utility, "how" he secured his job, and the future he and other young men face in the industry.

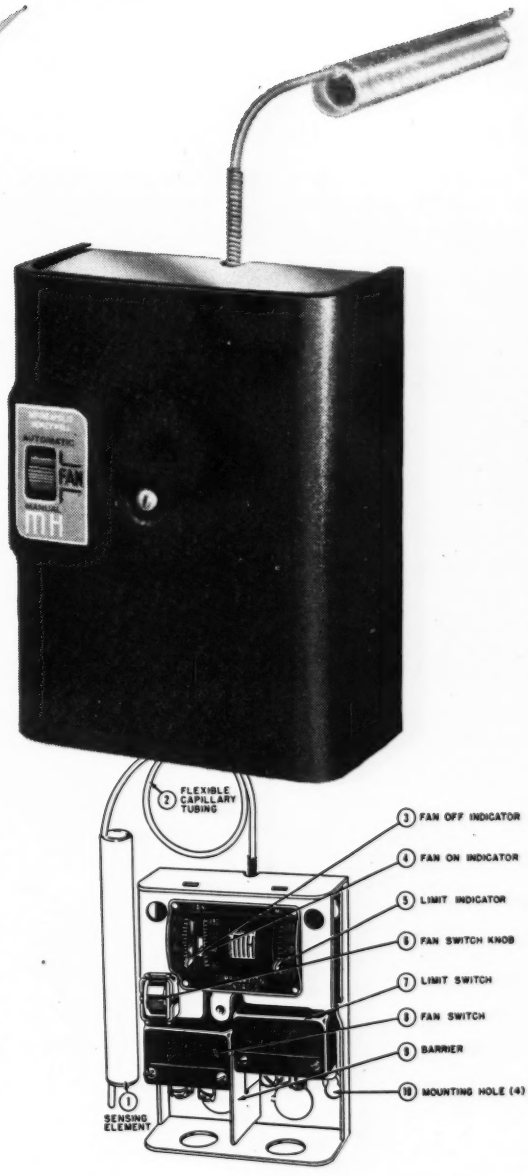
Although new officers will not be elected until the board meeting in December, two division chairmen were chosen. These were Harry W. Pitzer, vice president, Public Service Co. of Oklahoma, Chickasha, chairman of the electric division, and Earl J. Newlin, vice president, State Fuel Supply Co., Oklahoma City, chairman of the gas division.

Announcing the New Honeywell

L486 Combination Furnace Control

with Single Flexible Unit

NEVER BEFORE A FLEXIBLE ELEMENT CONTROL LIKE THIS!

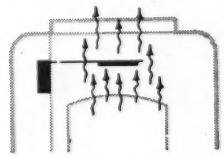


Yes, this new L486 is the only flexible element control that has a fail-safe feature. It does what no other control of its kind will do. It will break the circuit to the burner and start the fan if the single flexible element should ever rupture for any reason. This gives *positive* furnace protection, *positive* elimination of fire hazard. Thermostatically compensated for ambient temperature changes so switching action is sure and uniform.

Mounts in any position. The L486 can be mounted wherever it's most convenient and no leveling is required—yet you can always place the single element in the most effective plenum position. This means the L486 can be *factory-mounted* inside the furnace casing, permitting the heating plant to be shipped as an integral, ready-to-install unit. Capillary lengths from 10 to 60 inches make possible a wide variety of remote installations. Capillary can be extended vertically or horizontally from case.

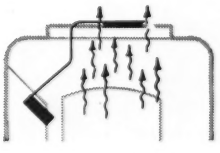
Easily accessible summer-winter switch and many other features are additional good reasons why you should use this better, safer control. For all the facts, get the new illustrated folder now. Call your local Minneapolis-Honeywell office. Or write Minneapolis-Honeywell, Dept. GS-5-88, Minneapolis 8, Minnesota.

Made to be mounted ANYWHERE



Inside casing

Outside casing



Remotely

MINNEAPOLIS **Honeywell**

First in Controls

Last Month

Ruthenburg Succeeds Hess As GAMA President

Servel's Louis Ruthenburg was elected president of the Gas Appliance Manufacturers Assn. at its annual meeting, April 16-17 in Chicago. He succeeds Frederic O. Hess, Selas Corp. of America.

Other new officers are A. B. Ritzenthaler, Tappan Stove Co., first vice president, and James Donnelly, A. O. Smith Corp., second vice president. Lyle C. Harvey, treasurer, and H. Leigh Whitelaw, secretary, were re-elected.

Outgoing President Hess set the tone of the meeting in his address. Home appliances have their greatest opportunity now when home conveniences are wanted more than ever, he said. "While we discuss the pros and cons of ventilation and ignition and automatic heat, and worry about the cost of these 'extras,' the automotive industry is selling our customers a gadget (automatic gearshift) to the tune of $450 million a year, about 50% of total annual gas appliance sales," he declared.

A contest for design of an all-inclusive gas utility kitchen, underwritten by the appliance industry, was suggested by Mr. Hess. "Could that not arouse the interest of architects . . . furnish designs for ventilation systems in homes . . . promote inclusion of gas incinerators and . . . development of competitive devices to the electric plug-in connector strip to reduce cost of installation, facilitate future additions, and simplify replacement sale of new appliances?"

Commenting on research and development, Mr. Hess said that a comparison of research expenditures with advertising and promotion allotments might well hoist a warning signal. "Appliances are primarily combustion devices sold for heat generation . . . Our primary concern should be and is combustion characteristics."

Details of a new gas appliance industry public relations program were announced at the meeting.

An all-out drive has been launched to expand public service, product development, and merchandising efforts. Carl Byoir & Associates, New York public relations firm, is cooperating in the plan.

* * *

Election of officers and presentation of citations for outstanding service were events of top interest at the American Petroleum Institute's three-day spring meeting in Columbus, Ohio, April 3-5.

Oil and gas executives from eight eastern states explored problems of defense production and national security which confront the industry.

Among new district officers were E. E. Roth, Columbia Engineering Co., New York, vice chairman; and K. C. Cottingham, Ohio Fuel Gas Co., Columbia, chairman of the advisory committee.

In recognition of distinguished service in API district activities, "citation for service" awards were conferred upon the following gasmen: J. French Robinson, East Ohio Gas Co., Cleveland; J. G. Montgomery Jr., United Natural Gas Co., Oil City, Pa.; J. H. Newlon, Equitable Gas Co., Pittsburgh; Christy Payne Jr., The Peoples Natural Gas Co., Pittsburgh; J. J. Schmidt, East Ohio; V. F. Bowyer, People's Natural; and J. V. Goodman, Equitable.

* * *

Frank M. Porter, president of the American Petroleum Institute, has been named the American vice president of the Third World Petroleum Congress to be held at The Hague, Netherlands, May 28 to June 6. Announcement of the appointment was made last month by K. G. Mackenze, secretary of the U.S. national committee of the congress.

Mr. Porter had previously been appointed to the international meeting's Committee of Honor. Other American petroleum leaders on this committee are W. Alton Jones, president, Cities Service Co.; E. O. Thompson, Texas Railroad Commission; and Dr. W. E. Wrather, director, U.S. Geological Survey.

* * *

At the 41st annual convention of the Indiana Gas Assn., held April 26-27 at French Lick, C. K. Graham, Southern Indiana Gas & Electric Co., Evansville, relinquished the association presidency to E. E. Linburg, Richmond (Ind.) Gas Corp.

"PAR At Work" was the title of an address given by D. A. Hulcy, president of AGA and Lone Star Gas Co., Dallas. In addition, the program included the following presentations: "The Automatic Gas Clothes Dryer—A Great New Profit Opportunity," Charles Rippe, Hamilton Manufacturing Co., Two Rivers, Wis.; "The Death of a Sales-

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TYPE "M" ODORIZER
Proven Over 15 Years of Actual Use

Yes, hundreds of Peerless Odorizers are doing a big job all over the country. They are providing the most accurate and trouble-free odorization available.

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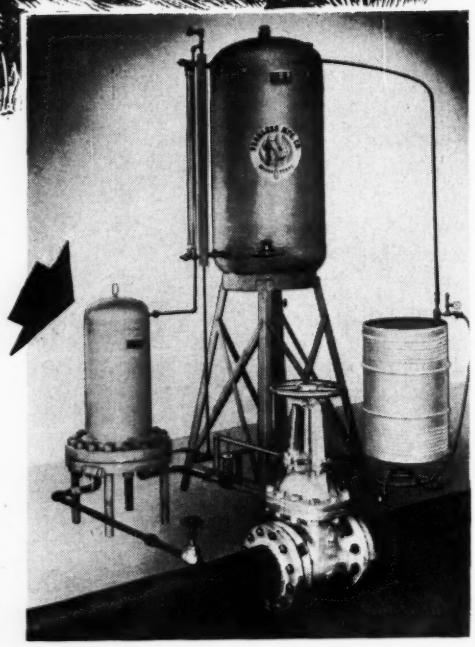
Years of satisfactory service have established the Peerless Type M Odorizer as the leader.



A typical installation of a Peerless Type "M" Odorizer.

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to solve any odorizing problem

ORONITE CHEMICAL COMPANY

TO WATCH IN

Calodorant "C" Gas Odorant

Oronite is the pioneer in the field of gas odorants. You get the benefit of longest experience in the field plus a choice of five odorant products, including cyclic sulfides and mercaptans. Oronite has the right gas odorant to solve your problem.

1. CALODORANT "C". Built to Gas Engineers' specifications, this superior gas odorant practically eliminates corrosion due to sulfur. It contributes the least amount of sulfur (see column left), has high thermal breakdown point, exceptional stability, a true "gassy" odor. Gives good odorization at ½ pound per MMCF of gas.

2. CALODORANT "C" SPECIAL. Has essentially the same characteristics as Calodorant "C" except that it has been compounded so that it can be used at 1 pound per MMCF. This facilitates its use through odorizers which cannot be accurately adjusted to a ½ pound rate.

3. THE ORIGINAL CALODORANT. The most widely used gas odorant in the gas industry, Calodorant is a cyclic sulfide type. Produces an intense "gassy" odor, is low in cost and easy to apply—two gallons per MMCF of gas provide good protection.

4. LP GAS ODORANT. Made especially for LP Gas but works as well in natural gas. It is ideally suited where conditions dictate a narrow boiling range mercaptan type odorant.

5. ALERT. A mercaptan odorant that produces a strong gas-like odor. Low in cost, packed in 375 pound drums, one drum is enough to treat 750 MMCF of gas under normal conditions.

man—Its Implications in the Gas Industry Today," Howard D. Valentine, Peoples Gas Light & Coke Co., Chicago; "Discovery and Development of Leadership in Industry," Dr. R. K. Burns, University of Chicago; "Trail Blazing in Industry," T. A. Boyd, General Motors Corp., Detroit; "Americans Thrive on Struggle," Dr. M. O. Ross, Butler University, Indianapolis.

This Month

Clinics Feature Research, Utilization Conference

Extensive clinics and question and answer periods dealing with research, utilization practices, servicing, and changeover as it affects utilization are to be held as a special feature of the 1951 AGA Domestic Research and Utilization Conference at Hotel Statler, Cleveland, Ohio, May 24-25.

While the conference is designed especially for engineers and servicing, installation, and general technical personnel of gas companies and appliance and equipment manufacturers, technical and non-technical papers on water heating, space heating, air conditioning, and cooking will be presented, and a number of sales and operating executives are expected to attend.

A new set of colored pictures demonstrating how the flame changes with each gas change will be shown at one of the luncheons, and an address by a leading public relations expert is scheduled for the second luncheon.

AGA's Cleveland Laboratories will welcome conference attendants on May 23.

Industrial Gas School Set

Industrial gasmen will gather at Pittsburgh's Hotel William Penn, May 14-18, for the 1951 AGA Industrial Gas School, sponsored by the Industrial and Commercial Gas Section. Chairman Terry Hart, Nashville (Tenn.) Gas & Heating Co., and his sales training committee have arranged the course to provide basic training for new men and to serve as a refresher and advanced course for more experienced men.

Sessions will provide instruction in the utilization and sale of gas for industrial purposes under the headings of fundamentals; heavy industrial applications; steam generation and fluid heating; special applications including high speed gas heating, prepared atmospheres, and food processing; and industrial sales problems and salesmanship.

Among prominent gasmen who will lecture during the five-day course are Jack Huebler, Surface Combustion Corp., and H. F. Rehfeldt, Peoples Gas Light & Coke Co., who will discuss principles of combustion of various fuels and burners and combustion systems used on industrial gas equipment; Floyd B. Neyhart, Carrier Corp., on air conditioning with gas; Charles C. Eeles, The Ohio Fuel Gas Co., who will talk about competitive and standby fuels; and Ralph S. Wenner, Ohio Fuel, on customer relations.

* * *

The sixth annual short course in gas appliances, to be held at the University of Tulsa, May 28-30, will include intensive instruction on the servicing of appliances.

Announced purposes of the course are to provide instruction for gas utilization service personnel on the design and functions of modern gas appliances, to acquaint registrants with developments in the gas industry, and to demonstrate correct methods and techniques of appliance installation and servicing.

One feature of the course will be a service supervisor round table for supervisory personnel under the direction of M. S. Bolinger, Arkansas Louisiana Gas Co., Shreveport.

Displays will include working models of single point and electric ignition systems, and late models of service and installation trucks employed by a number of gas companies.

The short course is offered by the univesity's college of petroleum science and engineering, and it is sponsored by the Southern Gas Assn.

* * *

New Jersey Utilities Assn. members who attend the organization's spring meeting at Seaview Country Club, Absecon, on May 4 will have an opportunity to hear panel discussions on four subjects.

Topics and leaders are "Physical Plant and Service Protection," Halsey Polhemus, Jersey Central Power & Light Co.; "Manpower and Wage Controls," Harold Lord, New Jersey Bell Telephone Co.; "Employment Practices," Gordon Peterson, Public Service Electric & Gas Co.; and "Material Controls and Priorities," C. O. Carlson, Atlantic City Electric Co.

Alfred E. Driscoll, governor of New Jersey, is scheduled as dinner speaker.

TWO NAMES TO REMEMBER
FOR HELP WHEN YOU NEED IT
— OR BEFORE

COMMONWEALTH SERVICES · INC.
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This is a day of technical, economic, social and regulatory changes and developments — numerous and fast-breaking. It calls for specialization in nearly every phase of business.

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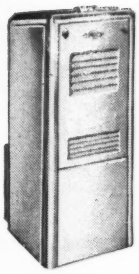
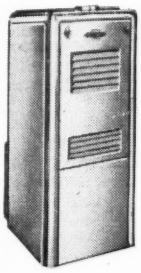
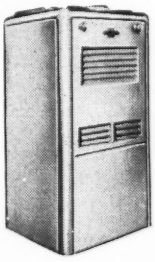


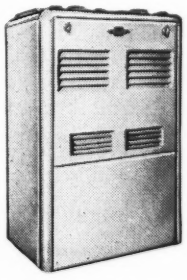
Model GA-63: 62,500 Btu input with Natural, Manufactured, Mixed or LP-Air Gas. 60,000 Btu input with LP Gas.



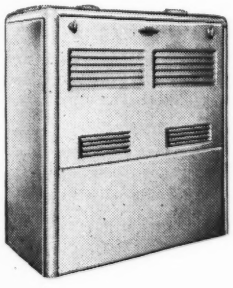
Model GA-90: 90,000 Btu input with all gases.



Model GA-120: 120,000 Btu input with all gases.



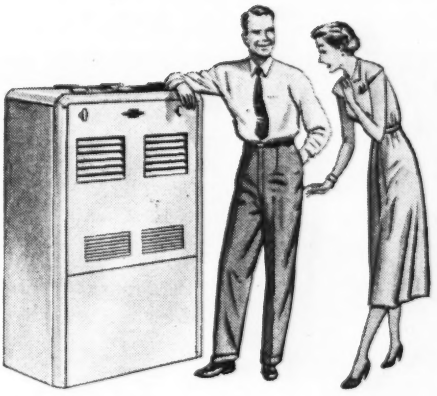
Model GA-150: 150,000 Btu input with all gases.



Model GA-210: 210,000 Btu input with all gases.

YOU'LL LIKE DELCO-HEAT GAS CONDITIONAIRS

The line with special features for you and your customers!



The basic idea behind the engineering of Delco-Heat Gas Conditionairs is to manufacture the finest gas-fired forced warm air furnace ever made—with all of the features that make a heating unit sell.

To give the Conditionairs their great efficiency, the "Multi-Rad" heat exchanger was developed. The "Multi-Rad" heat exchanger is composed of a series of sections, with continuous-welded construction. Each of the multiple sections completely encloses the flame from a separate ribbon-type burner head. The design gives a maximum radiation area to the heat exchange system so that it can extract the greatest amount of heat from the fuel.

The blower-filter units in the Conditionairs are powered by Delco Appliance's famous *Ridgidframe* motors—quiet operating, more dependable and more efficient. A built-in draft hood and all gas controls are completely enclosed in trim, compact, really good-looking cabinets finished in Delco-green enamel.

The simplicity of design, and the efficiency of General Motors mass production methods, make it possible to sell Delco-Heat Gas Conditionairs at competitive prices. And the ease of installation and service—the comfort and satisfaction they offer home-owners—make Delco-Heat Gas Conditionairs the outstanding values in their field.

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CALENDAR

MAY

New Jersey Gas Assn. Home Service Conference—Military Park hotel, Newark, May 2.

New Jersey Utilities Assn. Spring Meeting—Seaview Country Club, Absecon, N.J., May 4.

AGA Natural Gas Department Spring Meeting—Baker hotel, Dallas, May 7-8.

Missouri Assn. of Public Utilities—Jefferson hotel, St. Louis, May 7-9.

LPGA Annual Convention & Trade Exhibit—Stevens hotel, Chicago, May 7-10.

National Resturant Exposition—Navy Pier, Chicago, May 7-11.

AGA Production and Chemical Conference—Hotel New Yorker, New York, May 14-16.

AGA Industrial and Commercial Gas Section Industrial Gas School—William Penn hotel, Pittsburgh, May 14-18.

Pennsylvania Gas Assn.—Wernersville, Pa., May 15-17.

Public Utilities Advertising Assn. Convention—Hotel New Yorker, New York, May 17-19.

Missouri Assn. of Public Utilities—Jefferson hotel, St. Louis, May 21-23.

AGA Domestic Gas Research & Utilization Conference—Hotel Statler, Cleveland, Ohio, May 24-25.

American Society of Refrigeration Engineers Spring Meeting—Hotel Statler, Detroit, May 27-30.

Natural Gas & Petroleum Assn. of Canada—Royal Connaught hotel, Hamilton, Ont., May 31-June 1.

JUNE

Institute of Cooking and Heating Appliance Manufacturers Annual Meeting—Cincinnati, June 5-6.

AGA Executive Conference—Greenbrier hotel, White Sulphur Springs, W. Va., June 11-12.

Canadian Gas Assn.—Bigwin Inn, Lake of Bays, Ontario, Canada, June 18-21.

New York-New Jersey Regional Gas Sales Conference, Residential Gas Section—Spring Lake Beach, N. J., June 19-20.

Michigan Gas Assn.—Grand hotel, Mackinac Island, Mich., June 25-26.

JULY

American Society of Heating & Ventilating Engineers Semi-Annual Meeting—Portland, Ore., July 2-4.

SEPTEMBER

Pacific Coast Gas Assn. Annual Convention — Fairmont hotel, San Francisco, Sept. 4-6.

New Jersey Gas Assn. Annual Meeting—Monmouth hotel, Spring Lake, N. J., Sept. 7.

Maryland Utilities Assn. Fall Conference—Virginia Beach, Va., Sept. 22-23.

OCTOBER

Texas Mid-Continent Oil & Gas Assn. Annual Meeting — Beaumont, Texas, Oct. 8-9.

39th National Safety Congress & Exposition of the National Safety Council—Chicago, Oct. 8-12.

AGA Annual Convention—St. Louis, Oct. 15-17.

National Metal Congress and Exposition—Detroit, Oct. 15-19.

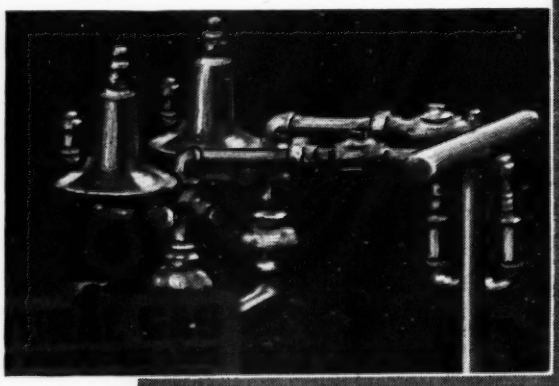
NOVEMBER

American Society of Mechanical Engineers—Chalfonte-Haddon Hall, Atlantic City, Nov. 25-30.

DECEMBER

Institute of Cooking and Heating Appliance Manufacturers Semi-Annual Meeting—Cincinnati, Dec. 3-5.

A WIDER RANGE
... of Delivery Pressure Control



REYNOLDS HIGH PRESSURE LINE REGULATORS

in parallel hookup have an increased range of capacity as well as a wider range of delivery pressure control. This also provides greater margin for emergencies. On inlet pressure the range is up to 650 pounds. For outlet pressure, this unit assures absolutely accurate and dependable control from 2 to 100 pounds. This variance in outlet pressure is made by use of different sizes of diaphram cases and further flexibility in the spring type is possible by use of different strength springs.

BRANCH OFFICES

H. D. "MIKE" MEUFFELS
423 Dwight Building
Kansas City, Missouri

SEIDENGLANZ & CO.
2nd Unit, Santa Fe Building
Dallas, Texas

REPRESENTATIVES

EASTERN APPLIANCE COMPANY
Boston, Massachusetts

WALDO S. HULL
163 W. Queen Lane
Philadelphia, Pennsylvania

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

...IN OREGON...EVERYONE AGREES...

choose Hamilton

the Original Automatic Gas Clothes Dryer

Mrs. Harry Weber, a leading Portland, Oregon homemaker, says:

"My Hamilton Dryer is the one appliance in my home that I could not possibly do without. It has saved me hours of time, and certainly fluff dries my clothes so they are softer and whiter. I am very thankful to Lipman's, the Hamilton dealer who taught me how to dry my clothes the Hamilton way, ready to iron or put away."

Lipman's, Portland, Oregon Hamilton Dealer, says:

"The Hamilton Clothes Dryer franchise is one of the most valuable franchises we have ever had. Public acceptance is tremendous. The salesmen like to demonstrate the dryer, and we appreciate the Hamilton sales promotion and advertising help that is supplied by F. B. Connelly Company of Oregon, my Hamilton distributor."

Mr. Frank C. Porter, Vice President and General Manager, Portland, Oregon Distributor for Hamilton, says:

"It is no wonder that our dealers value the Hamilton franchise so greatly. Substantial profit margin and low service cost, have given Hamilton leadership in the Northwest area. We are proud that our company is associated with the leader in the dryer field."

Make the Hamilton Franchise Your Choice

See Your Hamilton Distributor Today For Complete Details! "Gas and Electric Models"

HAMILTON MANUFACTURING COMPANY

Two Rivers, Wisconsin

NEWS

Regulation

Texas House Passes Bill Levying Gathering Tax

A bill which would levy a "gathering" tax of one cent per Mcf of natural gas has been passed by the Texas House of Representatives and was expected to go to the Texas Senate for action sometime late last month.

The measure, with which proponents expect to raise approximately $28 million annually, had been denounced by leaders in the state's gas industry as "unconstitutional and unfair" during the span of several weeks' hearings before the house.

R. L. Foree, president of the Texas Independent Producers and Royalty Owners Assn., and E. I. Thompson, vice president, led the fight against the bill, describing it as "dangerous."

Vernon W. Frost, secretary of the association, had vented the Texas gas industry's feeling that in view of the wide range in the prices of natural gas, a tax levied at a flat figure on the basis of volume alone is "unfair and inequitable."

Gasmen also felt that proponents of the bill were overlooking the fact that natural gas is sold in competition with other fuels. The current tax rate is 5.72% of its value as compared to 4.54% for oil. Excessive taxation of natural gas, they held, might well make it less attractive to the consumer.

Texas operators argued that Rep. James Sewell's $28 million estimated tax revenue must have been based on the 2822 MMcf put to beneficial use in 1950 but that exemptions for gas returned to earth and lawful venting reduce the taxable total to 2180 MMcf and would return but $21,809,000 in taxes.

Introduced by Mr. Sewell, the bill was recently taken from the revenue and taxation committee by house vote and given to the more favorable agricultural committee, when the former failed to take action.

Revenue from the proposed tax would be split as follows: 50% for rural roads, 25% for city streets and 25% for the public school fund. Thus the bill gained the support of agriculture, city, and education factions.

Nearly 30 states will be affected by the proposed Texas tax. According to Texas Railroad Commission records, 46% of the natural gas beneficially used was exported. Mr. Sewell estimates, however, that 62% of the tax would be paid by out-of-state users.

Controlled Materials Plan Announced By NPA

Controlled Materials Plan for application in the defense production program and certain supporting activities will become effective July 1, 1951, according to Manly Fleischmann, administrator of the National Production Authority, U. S. Department of Commerce.

Under CMP, materials (steel, copper, aluminum) will be allotted directly to manufacturers of defense program products, on the basis of detailed requirements submitted in advance.

Producers will be required to submit detailed reports of requirements for the basic materials on forms to be provided this month. Allotment of specific amounts of material will start July 1, following determination of the necessary production programs by the Defense Production Administration.

NPA believes that the plan will make it possible to authorize specific production schedules and allot material without exceeding the exact requirements for specific defense and defense-supporting production.

NPA further proposes to use the plan to determine production capacity in relation to defense requirements, scan the effect the defense program has on civilian production, estimate availability of materials at given times, and take "steps desirable to maintain a healthy civilian economy."

Consolidated
TITRILOG

ACCURATELY RECORDS THE ODOR LEVEL OF NATURAL GAS

Model 26-102
SPECIFICATIONS
Furnished complete in floor mounted cabinet 22½" x 18½" x 66". Operates on standard 60-cycle, 115-volt power—requires approximately 6 amperes.

Gas companies, faced with the need for safe and economical distribution, recognize the importance of odorizing gas to a known and fixed level. The new Model 26-102 Consolidated Titrilog offers an effective and economical method of measuring and controlling this odorization.

The Consolidated Titrilog provides a continuous record of the exact concentration of odorant in the gas stream. With this record the maintenance of a constant odor level becomes a simple matter. In addition, the Titrilog's strip chart becomes a permanent record of effective odorization should evidence be required.

Sulfur compounds, such as H_2S, SO_2, mercaptans, thioethers, thiophene and organic disulfides, are recorded quantitatively in concentrations as low as 0.1 ppm or 0.005 grains per 100 cu. ft. Compounds of specific interest may be separately determined over a wide range of concentrations.

The Consolidated Titrilog may also be used in applications such as corrosion in lines and appliances, sour gas treating, and others.

Write today for the fact-filled booklet on the Consolidated Titrilog. Ask for Bulletin CEC-1810-X21

CONSOLIDATED ENGINEERING
Corporation
Analytical Instruments CEC *for Science and Industry*
300 N. Sierra Madre Villa, Pasadena 8, California

You can turn LOOKERS into BUYERS with the new SERVEL

HERE'S Servel's new Royal Tudor . . . shortest route to your customer's checkbook. Packed with more of everything housewives want in a refrigerator, it's a competition stopper. Good looks, huge capacity and Servel dependability make it admired and wanted . . . make it sell!

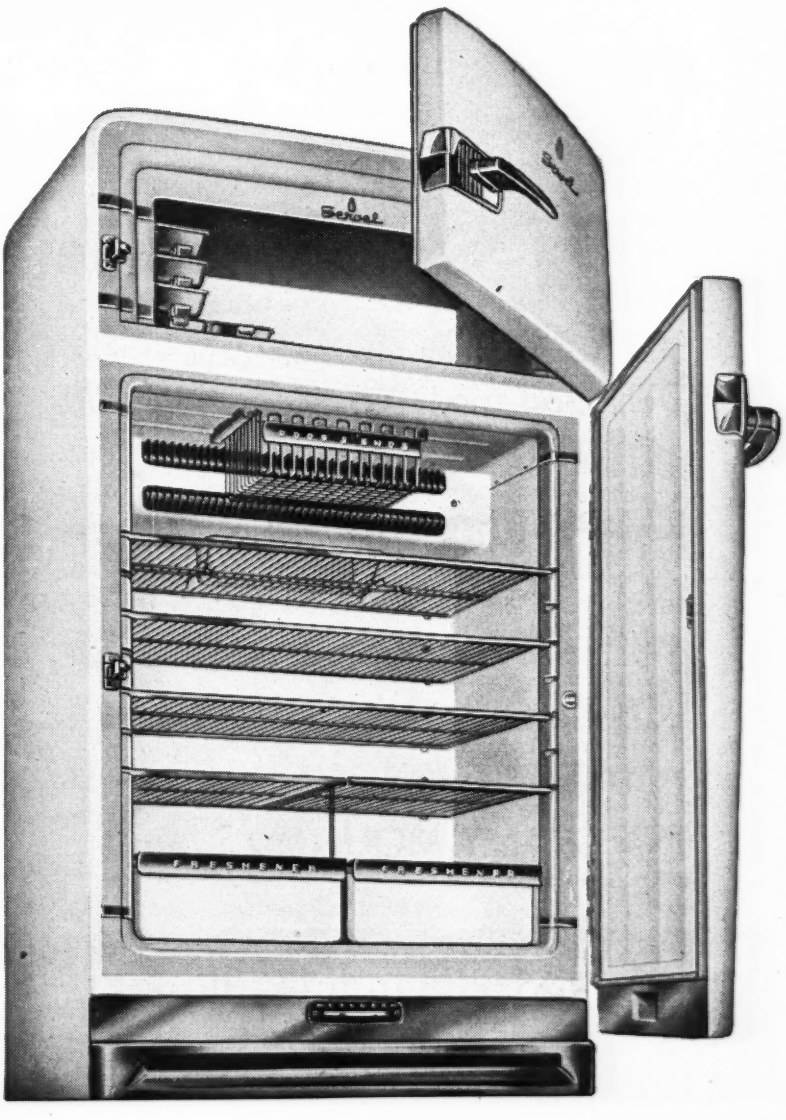
This handsome aristocrat of the new Servel line is much roomier inside, yet requires no extra kitchen space. It offers a wealth of sales-winning new features including the giant full-width evaporator with exterior door . . . glass-covered Dew-Action Vegetable Fresheners . . . 5 "Quick-Release" Ice-Cube Trays. And, of course, there's Servel's marvelous, motorless freezing system—famous through the years for silent dependable refrigeration.

So give prominent display space to the Royal Tudor and all seven other sensational new Servels. Every one is newly designed . . . engineered to attract prospects and clinch sales for you. For full details write Servel, Inc., Dept. I-15, Evansville 20, Ind.

STAYS SILENT . . . LASTS LONGER

Servel

The GAS Refrigerator



ROYAL TUDOR (Model BR-1118)—Volume, 11.5 cu. ft. 2 glass-covered Dew-Action Vegetable Fresheners. "Odds and Ends" Basket. 5 "Quick-Release" Ice-Cube Trays. Full-width evaporator with exterior door.

Manufacturers

Servel Adds Electric Refrigerator to Line

Production and sale of electric absorption-type refrigerators in this country by Servel Inc., Evansville, Ind., has been officially announced by the corporation's president, W. Paul Jones.

The gas refrigerator will continue to receive major emphasis in the concern's sales program, according to Mr. Jones, who added that the electrically operated refrigerator is being introduced in the U.S. (it was previously made for export markets only) to "strengthen and support the position of the absorption refrigerator through larger volume and lower prices."

More than 3½ million Servel refrigerators have been sold for gas, LP-Gas, and kerosene fuels in the past 25 years.

The announcement was made just prior to April 5 when Evansville, "The Refrigerator Capital of the World" noted Servel's 25th anniversary. Other refrigerator manufacturers in Evansville contributing to the city's new title are Coldspot and International Harvester.

D. A. Hulcy, president of AGA and the Lone Star Gas Co., was principal speaker at a celebration banquet arranged by the chamber of commerce. More than 30 Evansville merchants staged Servel silver anniversary displays in their stores through the week.

WEBSTER Series F600 BURNER

FOR
LOW PRESSURE GAS

Designed for LOW GAS PRESSURE
INTERCHANGEABLE PORTS
RADIANT fire brick top
NO COMBUSTION CHAMBER required
WILL NOT VIBRATE
LOW draft loss
ANY SHAPE and SIZE
INTEGRALLY MOUNTED Pilots

*TRADEMARK

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Rockwell Announces New Freeport Division

Organization of a new and separate division at the Freeport, Ill., plant of Rockwell Manufacturing Co. for fabrication of armor plate was accompanied by an announcement of appointment of top divisional officials by W. F. Rockwell Jr., president.

The division will occupy several of the company's Arcade plant buildings in Freeport. It will be known as the Freeport division, and will operate independent of the Arcade division, which will continue to produce wood and metal working power tools.

C. C. Shenkle, former general manager of Rockwell's Pittsburgh-DuBois division, DuBois, Pa., will be general manager of the Freeport division. Mr. Shenkle will be succeeded by William T. Kiehl, former assistant general manager. John Osberg will continue as general manager of the Arcade division.

Coleman Furnace Receives Highest ASIE Award

Highest commendation of the American Society of Industrial Engineers has been accorded the Blend-Air, a new type home heating and ventilating system manufactured by The Coleman Co. Inc., Los Angeles. It is the first such award ever to be received by a manufacturer in the home heating field.

Blend-Air, the result of 10 years' research in air circulation and the heating of aircraft, moves heat through 3½-in. tubes instead of large, custom-built ducts. Heat tubes end at room "blenders" where furnace-heated air is mixed with the cooler room air.

The mixture is then discharged into the room in steady, continuous flow which prevents cool air from settling in the room and maintains, it is said, a differential of only 2° between floor and ceiling. The furnace is compact, the entire system completely packaged and standardized.

Ordnance Division Formed

A new subsidiary of Geo. D. Roper Corp., Rockford, Ill., has been established to manufacture large caliber, high explosive shells.

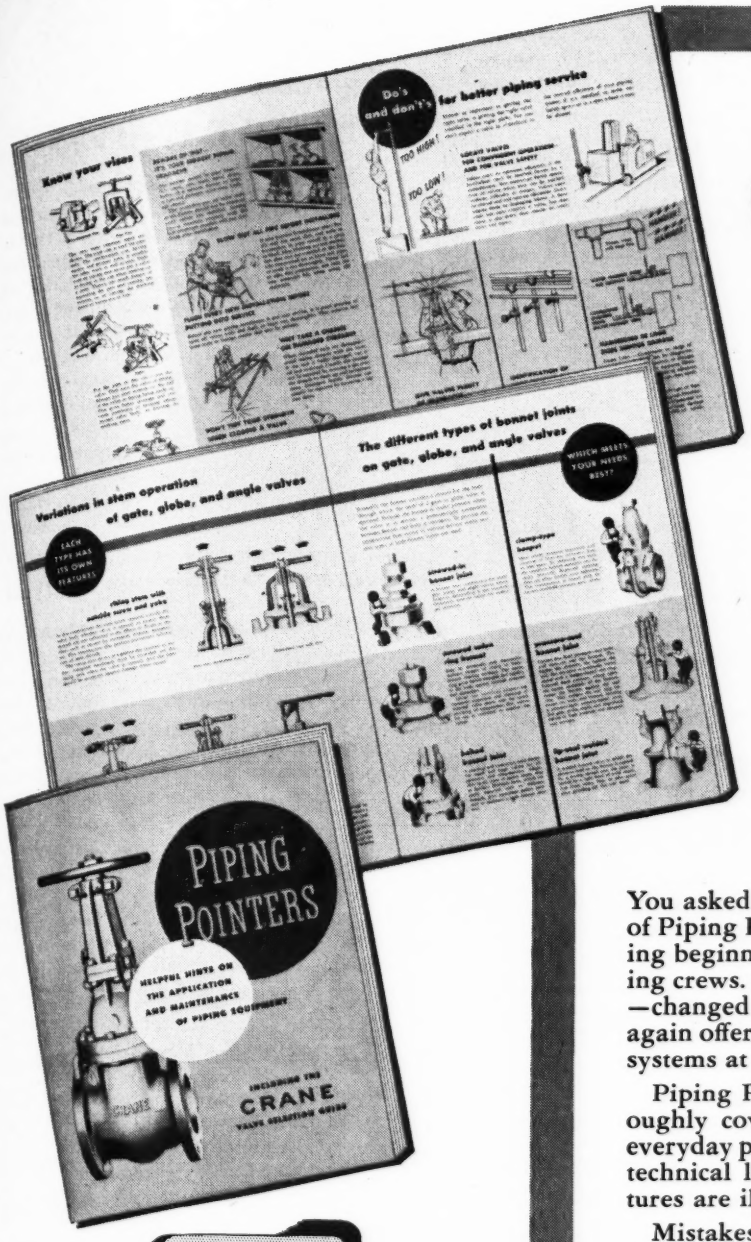
Several hundred new employees will be required for the Roper Ordnance Division Inc., and some ordnance men and engineers with backgrounds in war work will augment the Roper engineering staff.

Lionel R. Jensen, works manager, and Everett H. Shands, director of engineering, will be associated with the new plant's work.

Newsnotes

An additional 5000 sq ft of space is available at Dearborn Chemical Co.'s new offices in Chicago's Merchandise Mart. The move was made on April 16. Also housed in the new quarters are the company's Plumite division, its household drain cleaner, and Electro-Chemical Engineering Corp., a subsidiary.

General Utilities Corp. of Peoria, Ill., has been appointed by Servel Inc., Evansville,


Know your valves
Do's and don't's for better piping service
TOO HIGH!
TOO LOW!
Variations in stem operation of gate, globe, and angle valves
The different types of bonnet joints on gate, globe, and angle valves
PIPING POINTERS
HELPFUL HINTS ON THE APPLICATION AND MAINTENANCE OF PIPING EQUIPMENT
CRANE

PIPING POINTERS 16-mm SOUND FILM
Free Usage for Group Training

A 30-minute motion picture that dramatizes the fundamental information in the Piping Pointers Manual. Ideal for classroom or plant training groups. Available on request through your local Crane Branch.

Just Out!

NEW 36-PAGE EDITION OF

PIPING POINTERS

...a bigger, more helpful handbook for training maintenance workers

You asked for ¼ million copies of the last edition of Piping Pointers. You found it a big help in training beginners and refreshing veterans in your piping crews. The bigger and better edition is just out —changed in appearance but not in purpose. Crane again offers this booklet—to help keep your piping systems at peak efficiency.

Piping Pointers talks facts . . . not theory. Thoroughly covers the fundamentals of good, sound, everyday piping practices . . . in easy-to-grasp, nontechnical language. Its many "how-to-do-it" features are illustrated for easy understanding.

Mistakes in piping installation and maintenance cost more today. Piping Pointers can help your men avoid them. Just ask your Crane Representative for a copy.

PARTIAL INDEX TO PIPING POINTERS

HOW TO choose valves for every service . . . install valves . . . read reducing fittings . . . make up screwed joints . . . assemble flanged joints . . . make up solder joints . . . install pressure regulators . . . use vent and drain valves . . . avoid steam trap trouble . . . save on pipe joints and materials . . . handle piping tools.

plus THE CRANE VALVE SELECTION GUIDE

which saves time and effort in selecting valves for common piping services.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

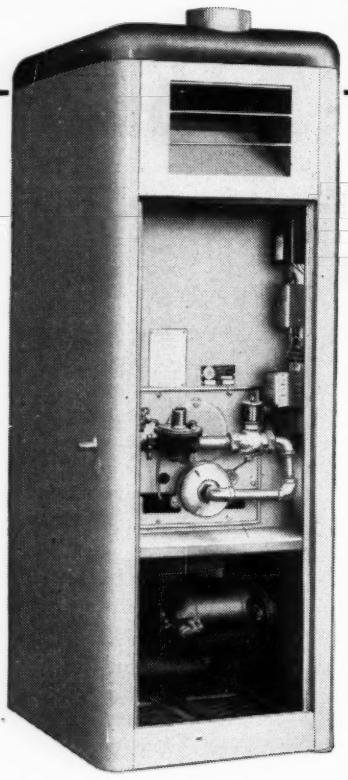
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Ind., as distributor for the company's line of gas refrigerators and water heaters in Peoria and Springfield trading areas. The new distributor has approximately 135 dealers in the two districts. Officers of General Utilities are Ben Markus, Wilmette, Ill., president; B. M. Winsburg, Milwaukee, general manager, and J. L. Fleisher, Peoria branch manager.

A multi-million dollar program of expansion for the Chemical division of Koppers Co. Inc., Pittsburgh, provides for construction of a new plant near Port Arthur, Texas, and additions to present facilities at Kobuta, Pa. As a result, the division's production of styrene monomer will increase 33% and production of the plastic, polystyrene, will be increased 25%. Koppers is currently the nation's third largest producer of polystyrene.

Ground was broken recently at Succasunna, N.J., for construction of a vertical turbine pump plant for Worthington Pump & Machinery Corp., Harrison, N.J., by C. E. Wilson, vice president in charge of sales. The new plant will be known as the Succasunna Works of the corporation and will supply the market east of the Mississippi. Worthington plants and wholly owned subsidiaries in the U.S. number 11 and eight more are located abroad.

LOW or HI-BOY...



This remarkable new

SECURITY

MODEL SFA FURNACE

handles any forced air problem!

Security leads the trend to compact efficiency with the new SFA Series. Adaptable to every domestic winter air conditioner situation. Versatile enough for conventional, basementless or utility room installations. Completely engineered for effortless, automatic heating. Yes, sir . . . the SFA brings greater economy and longer life to home heating!

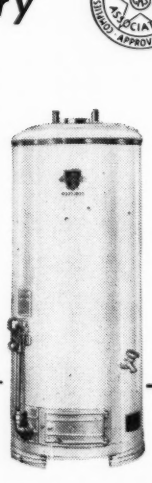
Only Two Connections Necessary

Completely assembled at factory. Hook up just one gas and one power line! Filter racks optional at bottom, right or left. Each control can be removed without disturbing other wiring. You'll be amazed at its versatility. Available for all gases. Write or wire now for complete information, prices.

SECURITY

SGP

SECURITY MANUFACTURING CO.
1630 Oakland St. • Kansas City 3, Mo.



Also manufacture the famous Security Heavy Duty Water Heater and full Line of Gravity, All-Purpose, and In A Wall Furnaces and Conversion Burners.

Financial

Equitable to Acquire Pittsburgh & West Virginia

Equitable Gas Co., Pittsburgh, recently received FPC authorization to acquire and operate the natural gas facilities of its subsidiary, Pittsburgh & West Virginia Gas Co., and the latter company was authorized to abandon all of its facilities subject to commission jurisdiction and to terminate service presently rendered through them.

Facilities involved are operated as a unified part of the Equitable system. According to the companies, the acquisition will permit a reduction in operating expenses and simplification of accounting procedures.

The transaction will not result in termination of service to any present customers.

North Penn Merger Okayed

Merger and consolidation of North Penn Gas Co., Allegany Gas Co., Alum Rock Gas Co., and Dempseytown Gas Co. into a new company, to be known as the North Penn Gas Co., has been approved by the FPC. Allegany, Alum Rock, and Dempseytown are subsidiaries of North Penn, and all four firms have main offices in Port Allegany, Pa.

The move is part of a plan of corporate simplification to comply with an SEC order requiring the dissolution and liquidation of Pennsylvania Gas & Electric Corp., North Penn's parent. Service will be continued to present customers of all the merged companies.

Minneapolis Rates Cut

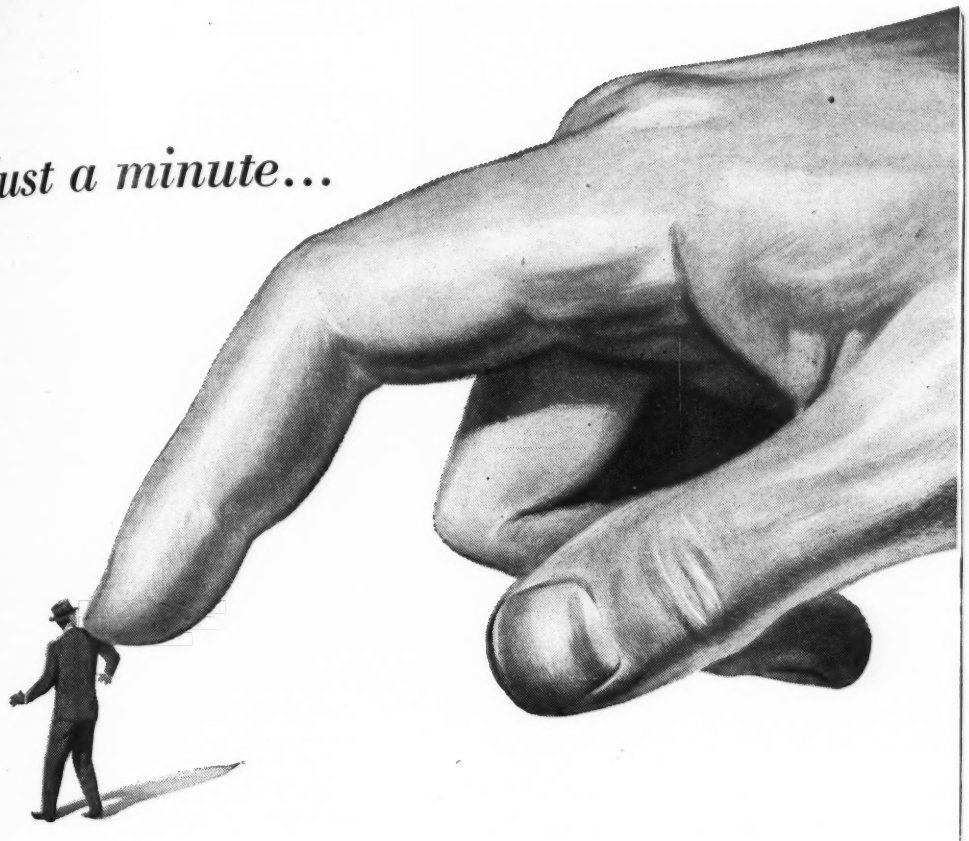
A temporary rate reduction of 10 cents per Mcf for a four-month period was put into effect recently by Minneapolis Gas Co. The cut, which will be terminated on June 30, is the third rate decrease since last August and the second this year.

The reduction, which will show on billings dated April 1 to July 31, was made because the firm's revenues rose above the estimate made by the utility when it filed its last notice. Under its franchise with the city, Minneapolis Gas' rates are subject to change every six months.

Oil City Group Merged

Approval of the merger and consolidation of five subsidiaries of National Fuel Gas Co., New York, has been granted by the Pennsylvania Public Utility Commission. To be known as United Natural Gas Co., the firm will include the former United Natural Gas Co., Oil City, Pa., Ridgway Natural Gas Co., St. Mary's Natural Gas Co., Smethport Natural Gas Co., and Mercer County Gas Co.

Some changes in operations and simplification of accounting procedures will result from the merger. The diminishing supply of natural gas in northwestern Pennsylvania fields, resulting in increasing dependence of the smaller companies on the United system, was cited as the chief reason for the merger.



...here's a real success story for YOU!

MURRAY brings you a proved sales-making appliance line . . . priced for all . . . made the new way in one of the world's finest plants!

MURRAY products include a full line of highest quality gas ranges . . . cabinet sinks, wall and base cabinets.

MURRAY has developed an extensive series of tests to insure a kitchen line of the very highest quality.

All the checks and controls assure you the very finest merchandise with all the features your customers want!

MURRAY special area advertising can be for you just as wonderfully effective in obtaining dealers as it has been for many other Murray distributors!

MURRAY helps you sell these new kitchen units by means of outstanding, hard-hitting ads appearing in the nation's leading publications, and aimed at your potential customers.

MURRAY is ever progressing, ever developing newer, better products that continue to nourish your year-after-year sales!

Especially for L. P. Gas!

Yes, every Murray Gas Range is set—right on the assembly line—for use with L. P. gas! No further adjustments are necessary.

And, of course, every Murray Gas Range has the full design approval of the American Gas Association for use with L. P.!

★ **VISITORS TO THE L. P. G. A. CONVENTION!** Don't miss seeing the beautiful new Murray Gas Ranges on permanent display at the Chicago Merchandise Mart Showroom 1124! May 8 to May 11.

THE MURRAY CORPORATION OF AMERICA, *Home Appliance Division,* Scranton 2, Pa.

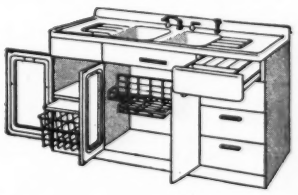
YOU'RE INVITED!

See all the Murray Gas Ranges (cabinets, too) at our Showroom 1124, Chicago Merchandise Mart!

MURRAY
Gas Ranges

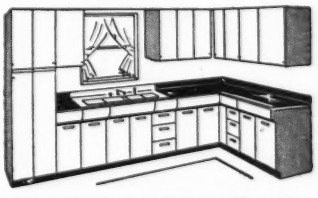
Richly porcelain enameled—acid and stain resistant. Handsome one-piece tops, with divided or grouped burners, have easy-to-clean seamless burner bowls, seamless "waterfall" front. Up-high broiler that's truly smokeless. Giant, porcelain enameled ovens. Use any type gas supply.

MURRAY
Cabinet Sinks



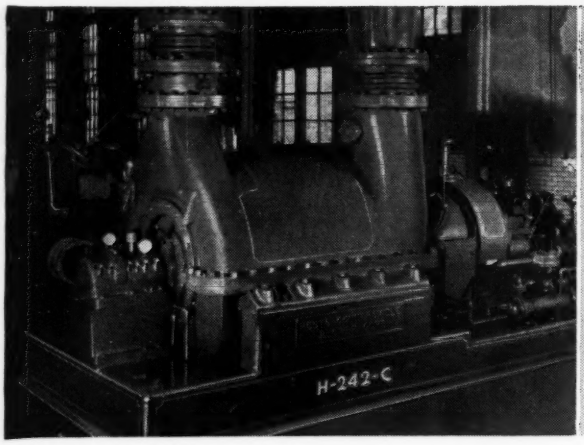
With every modern convenience! 66" model has double drainboards and sumps, breadboard, cutlery tray, storage space galore, vegetable basket. Other models in 54" and 42" sizes. Acid and stain resistant porcelain enamel on sinks; hi-baked enamel on cabinets.

MURRAY
Modern Cabinets



Beautifully styled wall cabinets with adjustable shelves, concealed hand grips, strong, semi-invisible hinges. Matching base cabinets have silent brass-runner drawers, sound-insulated doors, durable Vinyl plastic tops, heavy chromium band along top edge for highest-quality appearance!

Keep your eye on V-P-I
WHEN SELECTING
BLOWERS



CENTRIFUGAL

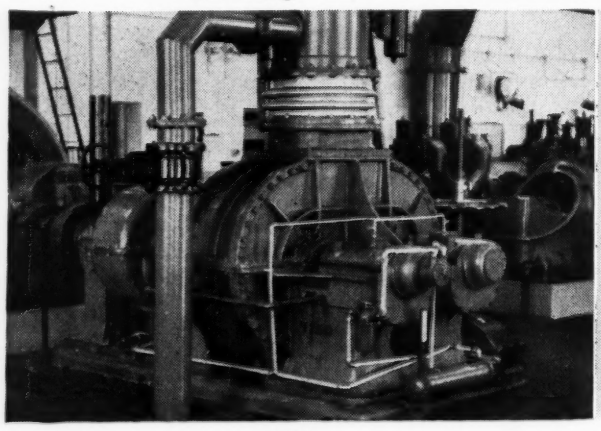
Turbine-driven Centrifugal Gas Booster in public utility, one of many R-C units used by this customer. Capacity 14,000 cfm.

You can't afford to risk shutdowns today because of unsatisfactory or inadequate equipment performance. To keep production moving at the required fast pace, calls for blowers or gas pumps that continuously deliver positive Volume at required Pressure—and at Low power costs to reduce operating expense.

You get these 3 essentials from R-C Blowers and Gas Pumps. Whether your needs call for Centrifugal or Rotary Positive units, we can match them from our exclusive *dual-ability line.* With capacities from 5 cfm to 100,000 cfm, you can usually find R-C units that closely fit your demands, with resultant savings in time, cost, space, weight and power.

From an experience of almost a century of blower building, our engineers will gladly make suggestions of the right R-C equipment to move or measure gas and air to keep production going.

ROOTS-CONNERSVILLE BLOWER CORPORATION
510 Oregon Avenue, Connersville, Indiana



ROTARY

Type RCGH Rotary Positive Gas Pump in eastern public utility plant. Capacity 6,750 cfm. This company is a large user of R-C equipment.

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

Newsnotes

Operating revenues of natural gas companies reporting to the FPC totaled $140,812,270 in December, 1950, an increase of 31.8% over the same month in 1949, the commission has reported. For the 12 months ending Dec. 31, 1950, revenues reached $1,211,960,354, up 24% over the previous 12 months. Gas utility operating income for the month was up 16.4% over December, 1949.

A proposed rate increase by Mississippi River Fuel Corp., St. Louis, which would amount to some $3 million annually, has been suspended by FPC and hearing set for May 14. The increase, which would affect eight of Mississippi's interstate wholesale customers, was to have become effective April 1.

Arkansas-Louisiana Gas Co., Shreveport, has proposed a 2-cent increase per Mcf in rates at the outlet side of its Waskom and Jefferson fields refineries. Application for authorization has been made to the Price Stabilization Board.

By a vote of 92 to 0 the Wisconsin assembly recently demanded that the state public service commission report to the legislature on why Wisconsin's natural gas rates are higher than those in surrounding states.

Miscellany

Pittsburgh Survey Reveals Record Appliance Sales

A survey conducted by the dealer relations staff of Peoples Natural Gas Co., Pittsburgh, shows record-breaking sales of 19,149 gas ranges, 16,493 automatic gas water heaters, and 991 gas dryers in the 10-month period between March 1 and Dec. 30, 1950.

Charles L. Yost, sales manager, pointed out that, projected on a yearly basis, the figures indicate that 11% of Peoples' customers purchased new ranges during the period, and 10% bought new gas water heaters. Sales of dryers would have been higher if more had been available, he stated.

The survey covers sales made by dealers since the utility left the gas appliance merchandising field on March 1, 1950.

McCall Award Announced

San Diego (Calif.) Gas & Electric Co.'s home service director, Mrs. Marjorie Hume, last month received the Laura McCall award for the second consecutive year. Presentation was made at the 17th annual sales conference of the Edison Electric Institute in Chicago.

For her "contribution to the advancement

CORRECTION

Robert Reed, author of "The Orsat" which appeared in the March issue of GAS, has pointed out that the headings "O_2" and "CO_2" in Table 1 on page 45 were transposed.

of homemaking through the use of modern appliances," Mrs. Hume received a plaque and a $200 check from *McCall's* magazine. Last year she was selected for the honor because of her radio program, "Meet the Chefs—Taste Their Best."

Shipment Tables Issued

Tables showing monthly shipments of domestic gas ranges for the period 1930-1950 and of automatic, gas-fired water heaters for 1936-1950 have been released by GAMA's marketing and statistical department.

Yearly totals for ranges reached 1,375,000 units in 1930, climbed to 1,742,000 by 1940, and totaled 3,023,000 in 1950. The prewar (1936-40) average is listed as 1,430,200 units per year.

Nearly nine times as many water heaters were shipped in 1950 as in 1936. GAMA's table shows 269,000 units shipped in 1936, 551,000 in 1940, 750,000 in 1945, and 2,363,000 in 1950. The 1936-40 pre-war annual average for water heaters is 425,800.

Missouri Poll Results Told

In a poll conducted by the Missouri Chamber of Commerce on the state's King-Thompson anti-strike law, 95% of the 342 persons replying favored retention of the law.

Asked the question: "Do you favor a law to insure gas, water, and electric services to you?" 328 persons said yes. To the second question: "Do you favor a law to prevent stoppage of this service to you as a result of a labor dispute?" 312 voted yes.

The poll list of 935 names included two farmers, laborers, business, and professional men in each community covered.

Newsnotes

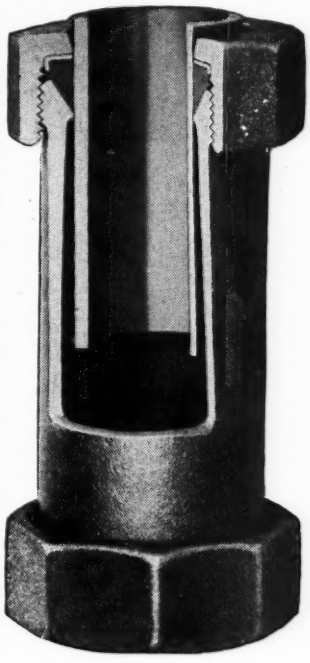
A new book promoting natural gas for heating has been published by Wisconsin Public Service Corp., Milwaukee, and recently was distributed to househeating dealers at a series of four meetings in the firm's territory. Titled "Natural Gas Heat Is Your Best Buy," the book refutes claims of coal dealers that gas heat is expensive.

Columbia Gas Co. employees have been advised by President Stuart M. Crocker that a polio insurance plan that would provide benefits up to $5000 for employees or members of their families, if stricken by the disease, has been added to their group hospitalization and surgical plan at no additional cost.

Kansas City TV-viewers are being reminded of the superior cooking features of automatic gas ranges through a number of short, narrated films produced for The Gas Service Co. by Alexander Film Co., Colorado Springs. One-minute commercials and 20-second films during station breaks are being used.

Bids for the construction of a municipally owned natural gas system for Monroe, Ga. are to be taken this month. The city has engaged the Littrell Engineering Co., Athens, Ga. to design the system and supervise construction.

NORMAC
COUPLINGS, SLEEVES and FITTINGS

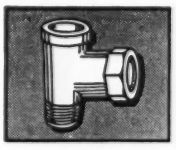


for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

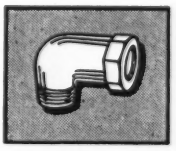
NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

COMPRESSION-END SERVICE "TEE"



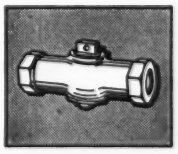
First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

COMPRESSION-END SERVICE "ELL"



Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

COMPRESSION-END IRON BODY BRASS CORE SERVICE STOPCOCKS



End the necessity of threading on the job plus the elimination of the threads themselves — combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

NORMAC BRASS FITTINGS DEVELOPED IN 1939 FOR USE WITH COPPER TUBING

Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

PEOPLES GAS BLDG., 122 S. MICHIGAN AVE., CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

PEOPLE

W. L. Smith

M. B. Edquist

. . . Amarillo Gas Co.

E. E. Matheson

O. W. Barnett

. . . Rockwell Mfg.

Three executive promotions were announced recently by Amarillo (Texas) Gas Co. W. L. SMITH was named vice president and general manager, and M. B. EDQUIST was appointed vice president in charge of distribution operations. They have been affiliated with the firm since 1927 and 1935, respectively. THOMAS F. CARTWRIGHT, controller of Amarillo Oil Co., a subsidiary, was named a vice president of that company.

Rockwell Manufacturing Co., Pittsburgh, has announced several personnel changes in the sales force, including the appointment of E. E. MATHESON, former general sales manager, to act as liaison officer between production, engineering, and sales departments at Rockwell's Nordstom Valve plant in Oakland, Calif. Mr. Matheson joined Nordstom Valve as a sales engineer in 1928 and has been general sales manager since 1945. O. W. BARNETT, assistant sales manager for the Nordstom division, was named sales manager of warehouse and jobber sales. Now general sales manager for Nordstom valves is H. GOTTWALD, and R. R. BUSH is oil field products sales manager.

At a recent board of directors meeting of the Cincinnati Gas & Electric Co., MILTON J. PFEIFFER was elected a vice president in charge of the gas department. Mr. Pfeiffer joined Cincinnati Gas in 1927 as assistant superintendent of gas distribution, was promoted to superintendent of the gas production department, and in 1940 became manager of gas production and transmission. EDWIN R. ROTHERT, a veteran of more than 40 years' service with the company, retired on May 1. In 1923 he established the gas commercial department and was appointed its manager in 1928. He was named vice president of the company in 1946. Mr. Rothert was named to the AGA's "Hall of Flame" in 1948.

Affiliated Gas Equipment Inc., Cleveland, recently announced the election of J. A. HUGHES as vice president of Affiliated Gas and his appointment as general manager of the Bryant Heater Division. Mr. Hughes joined Bryant in 1949 as assistant general

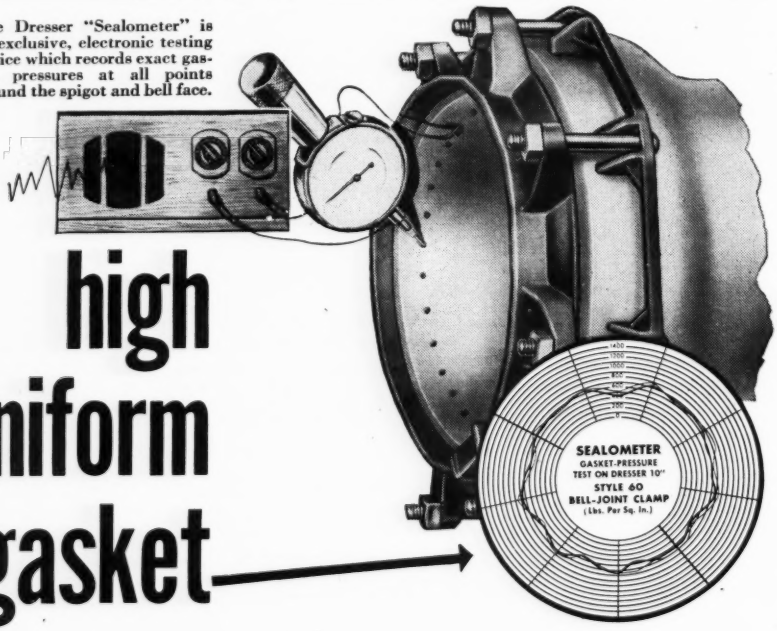
F. A. Early

J. A. Hughes

manager. The appointment of FRANK A. EARLY as manager of Bryant's Dallas branch was also announced. Mr. Early recently served as sales specialist for Servel Inc. with jurisdiction over multiple housing in 24 southern and western states.

Roots-Connersville Blower Corp., Connersville, Ind., has announced the following promotions: E. P. ROUDEBUSH to works manager in charge of production activities; D. A. JOHANN to sales manager in charge of sales and advertising, and A. E. CAUDLE

The Dresser "Sealometer" is an exclusive, electronic testing device which records exact gasket pressures at all points around the spigot and bell face.



high uniform gasket pressure

SCIENTIFICALLY PROVED, THE DRESSER STYLE 60 BELL-JOINT CLAMP ASSURES PERFECT SEALING

• In a bell-joint clamp, the *minimum* gasket pressure must always exceed the *maximum* line pressure in order to prevent leakage. Thus, the greater the ratio of gasket pressure to working pressure, the higher is the factor of safety of the joint.

The Dresser Style 60 Bell-Joint Clamp, because it is scientifically designed and tested to provide *uniformly high* gasket pressures, assures a wide margin of safety—a more perfect seal every time. Because it has "essential adjustability" and a close fit (even on off-size pipe), there are no weak points through which gasket pressures may be lost.

Check your stock of Style 60's today. Sizes 3″ thru 60″.

Fix it once . . .
Fix it for good!

DRESSER BELL-JOINT CLAMPS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries) • In Texas: 1121 Rothwell St., Houston • In Canada: 629 Adelaide St., W., Toronto, Ont. • Sales Offices: New York, Philadelphia, Chicago, Houston, San Francisco.

Congratulations on "Gas" 25th Anniversary

We are proud also to
have a
Long Service Record to the Gas Industry

LP Gas ENGINEERS
CONTRACTORS for:

STANDBY
PEAK SHAVING
PROPANE AIR
ENRICHMENT

H. EMERSON THOMAS AND ASSOCIATES, INC.

WESTFIELD, N. J.

ART WASTIE — H. EMERSON THOMAS

Gas has got it... and so has *Enterprise*

★ **11 Beautiful Streamlined Models for the very best in Cooking with Gas**

See it in the SATURDAY EVENING POST ★ See it in BETTER HOMES & GARDENS

The 1951 line of ENTERPRISE Gas Ranges really DOES have everything – clean-lined, streamlined beauty and master-built construction by the MASTER STOVE BUILDER of the South for more than 70 years.

SEE IT IN ALL THESE BEST-LIKED NATIONAL MAGAZINES!

Larger Models Fully Automatic

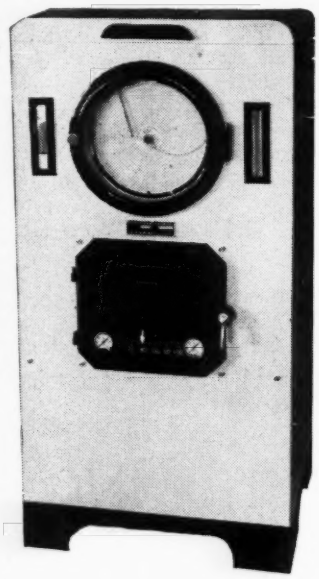
★ And see it in CHICAGO at the June Home Furnishings Market, Space 630-631

And write to us NOW for catalog and specification sheets AND THE PROFITABLE DEALERSHIPS AVAILABLE FOR THE 1951 ENTERPRISE.

PHILLIPS & BUTTORFF
MANUFACTURING COMPANY
Nashville, Tennessee – Est. 1858

ACCURACY IN GAS TESTS

With the following AC-ME and R.S. Specialties accurate tests and measurements are guaranteed



AC-ME Recording Gravitometer-Controller

CEMENT TESTING INSTRUMENTS
Super Pressure Consistometer
Cement Curing Chamber
Cement Slurry Mixing Cells

CORE TESTING INSTRUMENTS
Core Cutting Knife
Laboratory Core Drills
Porosimeter-Stevens Type
High-Pressure Flood Pots

GAS TESTING INSTRUMENTS
Recording Gravitometer
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Dew Point Tester
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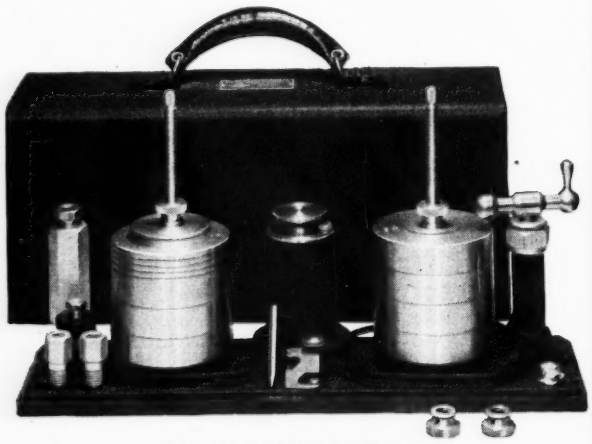
DEAD WEIGHT INSTRUMENTS
Standard Dead Weight Gauge
Portable Dead Weight Tester

LIQUID TESTING INSTRUMENTS
Liquid Gravitometer
Vapor Pressure Bombs
Pressure Hydrometer Jar
Specific Gravity Bombs
Corrosion Test Bombs

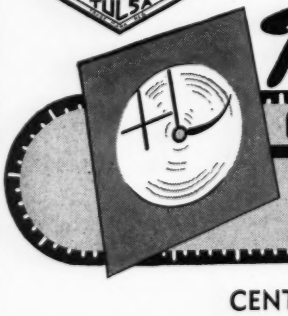
Write today for your copy Bulletin No. 50 Describing R.S. and AC-ME Testing Instruments

CENCO



R.S. Dead Weight Gauge

THE R.S.CO. TULSA



Refinery Supply Co.

621-23 E. 4th St. Tulsa 3, Oklahoma

Laboratory Apparatus
Instruments Chemicals
MANUFACTURER OF R.S. SPECIALTIES

CENTRAL SCIENTIFIC COMPANY
Subsidiaries of Cenco Corporation

to assistant sales manager. Formerly, Mr. Roudebush was assistant to the vice president in charge of manufacturing. Mr. Johann was manager of the Chicago office, and Mr. Caudle was chief application engineer.

Southern Counties Gas Co., Los Angeles, has announced the appointment of EDWARD B. PATTERSON as sales supervisor of the Harbor division following THOMAS G. ALLENDER'S retirement. Mr. Patterson joined the company in 1937, and in 1942 was granted a military leave of absence. He returned in 1945 and was appointed to the El Monte, Calif. office, and later the same year was promoted to local office superintendent at Whittier. J. STANLEY SWEENEY will take over Mr. Patterson's former duties while FRANK D. ROE will succeed Mr. Sweeney as supervisor of the Monrovia office.

Several appointments have been announced by Equitable Gas Co., Pittsburgh. JOHN T. BROWN has been named general counsel for Equitable and affiliated gas and oil companies, replacing B. H. SMYERS JR., who recently resigned. In 1938 Mr. Brown became affiliated with the Philadelphia Co. as

T. H. Evans

J. T. Brown

an attorney and was appointed attorney for Equitable in 1950. THOMAS H. EVANS, former assistant general sales manager, is assistant to the vice president in charge of operations, and GEORGE D. PORTER is now manager of the valuation department.

The Department of the Interior has announced the appointments of ARNO C. FIELDNER and LOUIS C. MCCABE to direct and coordinate scientific research and experimentation activities in natural gas, petroleum, synthetic fuels, etc., for the Bureau of Mines. Dr. Fieldner, associated with the bureau since 1910, has been named chief fuels technologist. Dr. McCabe succeeds Dr. Fieldner as chief of the fuels and explosions division.

FREDERICK H. PATTERSON, secretary and treasurer of Rochester (N.Y.) Gas & Electric Corp., recently retired after 40 years of service. He became assistant auditor in 1913, assistant comptroller in 1920, added the duties of secretary in 1932, and in 1941 was named secretary-treasurer. Mr. Patterson was honored by 200 associates at a dinner marking his retirement.

Nordberg Manufacturing Co., Milwaukee, has announced two appointments in its heavy machinery division: ROBERT P. MCBRIDE as sales engineer and PAUL S. SHIRLEY as chief development engineer. Mr. McBride had been assigned to field installation service since joining the company last year.

F. S. Cornell
... A. O. Smith

Alec M. Crowell
... OPS

F. S. CORNELL, manager of A. O. Smith Corp.'s (Milwaukee) plant at Kankakee, Ill., has been appointed group executive for the Kankakee works, the eastern motor division at Tipp City, Ohio, and the heating division in Toledo. Mr. Cornell will headquarter in Kankakee and for the present will continue as manager there. C. R. Rigby has been named group executive of the company's Houston plant, and F. B. DUNN will be in charge of personnel for the Houston works and eight southwestern states.

ALEC M. CROWELL has taken a leave of absence from Natural Gas Associated Consultants, New Orleans, to become chief of the Fuel and Chemical section, New Orleans district, Office of Price Stabilization. He will help to organize the OPS program regarding natural gas, crude oil, gasoline, heating oils, kerosene, liquefied petroleum gas, etc. Mr. Crowell was previously a director of the Oil & Gas Division, Texas Railroad Commission; Arkansas Oil & Gas Commission; Mississippi Oil & Gas Engineering committee; and Production and Reserves branch, Oil & Gas Division, U. S. Department of the Interior.

JACK A. BELL, who joined Alabama Gas Corp., Birmingham, as kitchen consultant in 1945, has been recalled to the air force. Mr. Bell has administered the company's New Freedom Gas Kitchen program and has been responsible for window and floor display, advertising, television, promotion, and home service planning.

NORMAN R. MCKEE, retired utility executive, has been elected president of the James H. Knapp Co., Los Angeles industrial engineering firm. Prior to his retirement last year, Mr. McKee was vice president of Southern Counties Gas Co., Los Angeles. He has been a director of Knapp for 15 years.

C. K. Moerk

Crane Packing Co., Chicago, recently announced the transfer of CHARLES K. MOERK to its San Francisco office. Mr. Moerk will act in the capacity of sales engineer, handling all of the products in the "John Crane" line of packings, mechanical seals, and lapping machines. He joined the company in 1937 and spent four years in the mechanical seal production department before entering the service. In 1947, he returned to the Crane company.

Available
NRC
NATIONAL SECTION
NATIONAL
SECTIONS FOR COOLING AND CONDENSING
The timely advantage of availability is in itself a logical basis for serious consideration of NATIONAL Sections for Cooling and Condensing.
Many installations handling diverse fluids in petroleum refining, natural gas and manufactured gas fields are demonstrating the efficiency, durability, accessibility and compactness of National Sections.
Exceptional high quality cast iron used, simplified design, physical characteristics and installation benefits are bringing to users most satisfactory results with low initial and operating costs.
Following are types of applications suitable for either sprayed or submerged service:
PETROLEUM REFINERIES
Crude Still Condensers, Pressure Distillate Condensers, Sidestream Coolers, Bottoms Coolers, Lube Oil Coolers, Engine Water Coolers, Natural Gas Coolers, Gasoline Condensers.
GAS INDUSTRIES
Scrubbing Liquor Coolers, Washer Water Coolers, Engine and Compressor Jacket Coolers, Gas Aftercoolers, Tar Dehydrator Condensers, Final Cooler Liquor Coolers.
OTHER NRC PROCESS EQUIPMENT
Tubular Heat Exchangers · Oil Treating Heaters
Water Heaters · Pressure Vessels · Engine Coolers · Special Castings
Heat Transfer Division
NRC
THE NATIONAL RADIATOR COMPANY
JOHNSTOWN, PENNSYLVANIA
SEND COUPON TODAY!
The National Radiator Co., Heat Transfer Division, G
Johnstown, Pennsylvania
Please send Technical Manual HT-20 on National Condensing and Cooling Sections.
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F. C. VAN POPPELEN, former assistant general manager, has been named general manager of General Electric Co.'s air conditioning department with headquarters at Bloomfield, N. J. Prior to joining General Electric in 1949, Mr. Van Poppelen was vice-president of the Hupp Corp. of Cleveland and has also been associated with E. I. duPont, General Motors, and Ford Motor Co.

D. S. SMITH has been elected president and chairman of the board of directors of Perfection Stove Co., Cleveland, replacing L. S. CHADWICK whose retirement was announced recently. Mr. Smith has been with Perfection since 1910, becoming vice president and treasurer in 1949 and executive vice president and treasurer the following year. The board also elected GEORGE MCCUSKEY secretary and treasurer of the company.

Consolidated Edison Co. of New York has announced the retirement of COL. JOHN STILWELL. Colonel Stilwell served 42 years with ConEd, having joined the company in 1909. As vice president his jurisdiction included the transportation, payroll, insurance, real estate, and resuscitation departments, and he has been chairman of ConEd's central safety committee since its inception in 1944.

WILLIAM SCHMIDT JR., chairman of the board, and CHARLES P. CRANE, president, head a list of officers recently re-elected by Consolidated Gas, Electric Light & Power Co. of Baltimore. Others are J. THEODORE WOLFE, executive vice president; RALPH L. THOMAS, vice president and executive engineer; HERMAN L. GRUEHN, A. L. PENNIMAN JR., JOHN H. WOLFE, and AUSTIN E. PENN, vice presidents, F. EDWARD RUGEMER, treasurer, and OTIS E. SMITH, secretary.

American Stove Co., St. Louis, has appointed JOHN M. BAYER as regulations and priorities manager, transferring him temporarily from the sales to the production department as advisor to the production planning staff and interpreter of government orders and regulations relating to production. Simultaneously it was announced that AMBROSE R. PIERCE, manager of the coal, combination, and kitchen heater range division since 1938, will replace Mr. Bayer as manager of the firm's Lorain, Ohio, sales division.

Among recent personnel changes announced by Borg-Warner Corp.'s Ingersoll Products divisions of Kalamazoo, Mich., was the appointment of R. E. LOEBELL as eastern sales representative. Mr. Loebell was formerly branch manager for Bryant Heater in Milwaukee. ALLEN BECHTEL was also added to the staff as sales representative for heating equipment in Ohio, western Pennsylvania, and western New York.

Johns-Manville Corp., New York, has announced the appointments of WILLIAM R. WILKINSON as vice president for sales and KENNETH W. HUFFINE as vice president for production. Mr. Wilkinson, general merchandise manager of the building products division for the past five years, succeeds L. M. Cassidy, now chairman of the board, and Mr. Huffine succeeds A. R. Fisher, recently appointed president.

Philadelphia Gas Works Co. has named FRANK H. TREMBLY JR. as vice president in charge of sales. Mr. Trembly became affiliated with the firm in 1931 as supervisor of the industrial division and since 1949 has served as a director and sales manager. He held the vice presidency of the American Gas Assn. in 1938-39 and the presidency of the Pennsylvania Gas Assn. in 1946-47.

CLAYTON G. CASSIDY, former advertising manager, has been appointed director of public relations and advertising of People's Gas Light & Coke Co., Chicago. Three managers have been named to assist Mr. Cassidy: DANIEL H. MOWAT, press relations; RAYMOND W. FENTON, advertising; and CHARLES J. MORSE, public relations.

R. M. MARBERRY has been appointed merchandising manager of the Timkin Silent Automatic Division, Detroit, with supervision over sales activities as well as advertising and sales promotion. Mr. Marberry joined Timkin, a subsidiary of Timkin-Detroit Axle Co., in 1934 as editor of the company's house organ.

Estate Stove Co., a subsidiary of Noma Electric Corp., Hamilton, Ohio, has announced the appointment of GORDON R. KEMP as assistant general manager. Mr. Kemp joined Estate in 1949 as assistant treasurer and controller. He will continue his duties as controller and credit manager.

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ARCCO ANUBIS
LIQUID GRAVITOMETER
...for PIPELINES, REFINERIES, GASOLINE PLANTS
This ruggedly built instrument of laboratory accuracy is ideal for quick checking and for continuous recording of Specific Gravity of liquids under line pressure. Changes in Specific Gravity of sample are recorded with a very minimum of time lag. Foreign liquids and gases are automatically purged from sample. No moving joints or stuffing boxes to cause friction or leakage. Temperature corrected, this precision instrument is adaptable to high pressures. Hundreds are in daily use in plants and refineries of major companies. Also available as a controlling instrument. Send for bulletin No. 111A.
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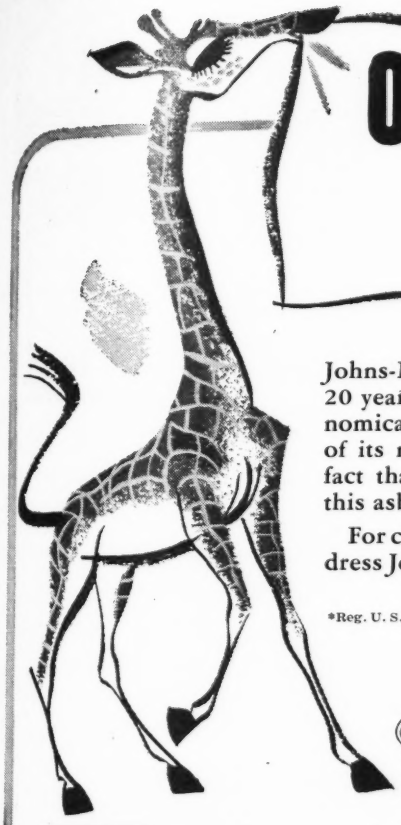
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
Available for Early Delivery
SEND FOR BULLETIN No. 111-A

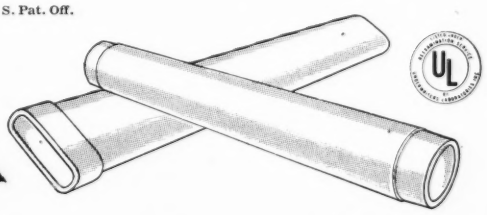
Over 50,000,000 ft. in service!

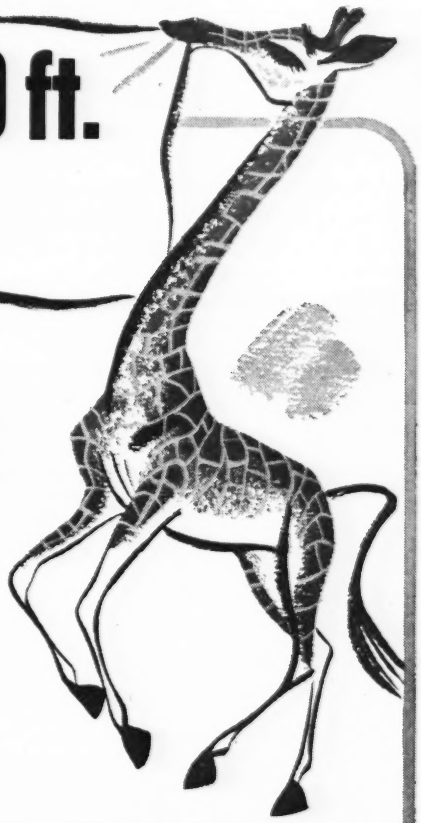


Johns-Manville Transite* Flue Pipe has for nearly 20 years enjoyed a reputation for dependable, economical service in thousands of installations. Proof of its many practical advantages is shown by the fact that there are more than 50,000,000 feet of this asbestos-cement pipe in use!

For complete details, write for folder TR-84A. Address Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.





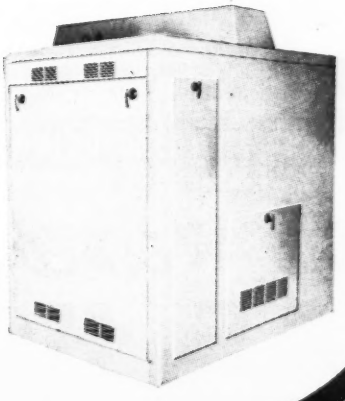
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE FLUE PIPE

FOR VENTING DOMESTIC GAS-BURNING APPLIANCES

The Economical Answer To Solution Heating Problems!

• Every man connected with the gas industry should know the story of the Evans Automatic Heating Unit—should know that this unit provides FULLY AUTOMATIC solution temperatures for bottle washing machines, at far lower cost than ever before known! Write for our folder: "The Calorific is Terrific." Know what to tell your bottling, brewing and dairy customers about the BEST in solution heating equipment!



Manufactured by:

G. C. EVANS SALES COMPANY
LITTLE ROCK, ARKANSAS

EVANS

• • • • • AUTOMATIC HEATING UNITS • • • • •

NEW PRODUCTS

Water Chiller

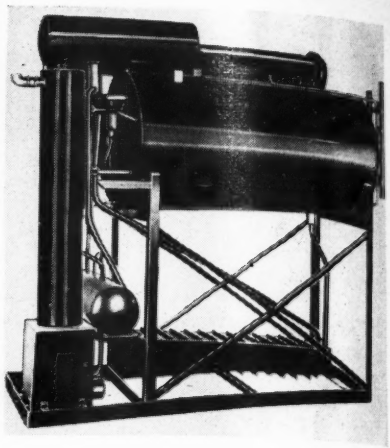
SERVEL INC., Evansville, Ind.

MODEL: Absorption-type water chiller.

APPLICATION: For use with air conditioning units or in manufacturing processes.

DESCRIPTION: Presently available for defense orders only, this unit's nominal refrigeration capacity rating is 20 tons when it supplies water at 45°. It uses 360 lb of steam per hour, and condensing water at 85°. If condensing water is available at lower temperatures, or if more steam is supplied, the result will be more than 20 tons of capacity.

Where waste heat or steam is available, the unit can be operated for industrial processing needs or comfort cooling and dehumidification at practically no cost, according to Servel. The unit is designed to deliver refrigeration in the form of chilled water, which is piped to separate air conditioner units, containing filters, coil, and fan. For winter operation, hot water may be supplied through the same piping system. Servel will furnish the refrigeration "core," leaving the choice of water circulating pumps, heat exchange surfaces, blowers, filters, steam controls, and cooling towers to the engineer or contractor.



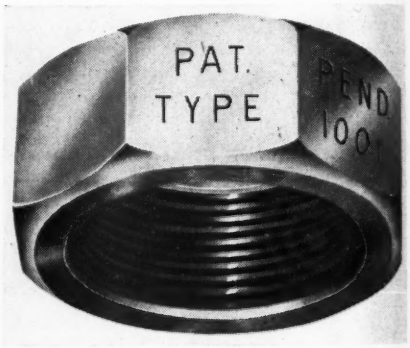
The unit is 30 in. wide, less than 8 ft long, and occupies 19 sq ft of floor space. It is hermetically sealed and capacity-tested at the factory.

Insulating Devices

UNIVERSAL CONTROLS CORP., Dallas.

MODEL: Insulated meter nut.

APPLICATION: By breaking metal-to-metal contact between the inlet pipe and the meter, this nut is suited for use on iron case meters of the Emco, Sprague, and Metric types. It may also be used on tin meters, providing a meter bar isn't located above the swivel. It will provide cathodic protection at the meter on farm tap lines connected with cross-country pipe systems.



DESCRIPTION: The outside of the nut is a standard malleable casting, machined for each meter type and electrolytically zinc plated to prevent rusting. Du Pont FM-10001 nylon plastic is molded into the inner part by the injection process. The plastic cannot slip because it is held fast by the metal's octagonal interior shape, eight fillets, and an extended "lip" on the bottom of the nut. The inside is cored to a smooth diameter and threads are machine cut for each size and type of meter.

A permanent joint is assured in hottest weather, the manufacturer claims, and the plastic is highly resistant to electricity. The meter nut will isolate gas and water distribution systems within a house and will prevent corrosion of the gas distribution system

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itself and prolong buried pipe life.

Installation requires removing the regular meter nut, putting a rubber gasket in place, and using the Universal nut to connect the swivel.

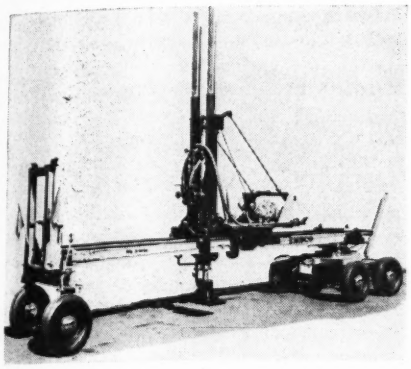
Tamping Machine

R.P.B. CORP., 2751 E. 11th St., Los Angeles 23, Calif.

MODEL: Tamping machine.

APPLICATION: For deep, wide tamping.

DESCRIPTION: The machine is designed so that it can be swung around to right angles with the truck by swiveling the rear wheels on the breaker. Operator sits on the carriage behind the two levers shown in the photograph, and the machine travels transversely with the ditch. It will tamp a trench 15 ft



wide and 15 ft deep. It will also tamp a canal bank where dirt has to be put on and tamped to a required density.

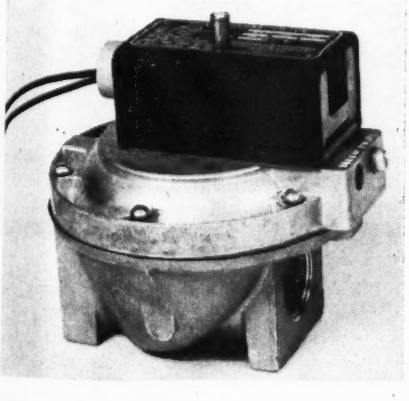
A heavy duty air motor propels the carriage and hammer, and the machine is designed so that it can be collapsed by another air motor and drum shown suspended under the carriage platform, thereby bringing the outward wheels of the machine closer to the truck. The hammer can be controlled to strike a blow ranging from a patting action to the full force of 5500 lb, and frequency speed ranges from a few blows per minute to 60.

Gas Control Package

MINNEAPOLIS-HONEYWELL REGULATOR CO., 2747 Fourth Ave. S., Minneapolis 8.

MODEL: Control system.

DESCRIPTION: Nucleus of this gas control package is a thermostat of improved design and sensitivity which regulates the frequency of burner operation so that less heat



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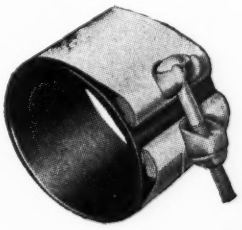

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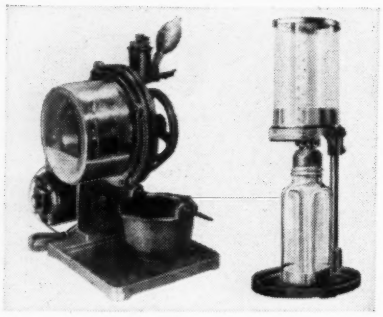

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is provided in mild weather and progressively more heat is supplied more often as outside temperature drops. The thermostat does not furnish more or less heat than the ordinary thermostat; it supplies heat in better planned intervals, avoiding fluctuations.

A compactly designed diaphragm gas valve, a feature of the control system, is said to provide quieter operation. Upon a call for heat, the relay coil in the upper portion of the valve is energized, actuating the plunger. This closes the gas supply port, at the same time releasing gas from the upper chamber through the bleed port. Immediately, gas (at line pressure) beneath the diaphragm raises it off its seat, thus opening the valve. When the thermostat is satisfied, the relay in the valve is de-energized, causing the plunger to close off the bleed port and permit gas at line pressure to fill up the upper chamber. With pressure equalized above and below the diaphragm, the valve seat is sealed off and the valve is closed.

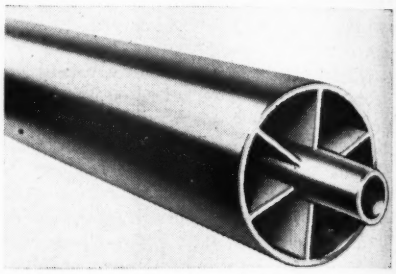
Radial Fin Tubing

MODINE MANUFACTURING CO., Industrial Division, Racine, Wis.

MODEL: Concentric radial fin tubing.

APPLICATION: Originally designed for a specific job involving low temperatures and high pressures, this tubing may also be used for gas liquefaction, condensing, exhaust heat recovery, and heating requirements involving viscuous materials.

DESCRIPTION: Fabricated of copper, steel, stainless steel, nickel, or other metals in



lengths up to 20 ft, it is suitable for a wide range of temperature and pressure requirements. For maximum heat transfer, intimate contact is accomplished by means of fusion bonding of fin and tube elements. Tubing may be equipped with "T" end fittings to provide connection to both passes, and it can be arranged in series parallel banks.

The tubing has been made with six radial fins, as shown in the photograph, and in 1-in. and 1⅜-in. diameters. Currently, it is engineered to meet individual applications and is offered only in production-lot quantities.

Refrigerator-Range

GENERAL AIR CONDITIONING CORP., Los Angeles.

MODEL: General Chef refrigerator-range combination.

APPLICATION: For small kitchens, guest houses, hotels, apartments, motels, and hospitals.

DESCRIPTION: Available with gas or electric range, the combination needs only 4.1 sq ft of floor space. The fact that the burners on the combination do not affect the

40-44° temperature maintained in the refrigerator is attributed to the use of 2-in. Fiberglas insulation. The freezer compartment has removable shelves for frozen food storage, and a vegetable bin is included. The General Chef is manufactured with four gas burners or three electric burners.

CURRENT READING

1951 EDITION OF HEATING, VENTILATING, AND AIR CONDITIONING GUIDE—American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York 10.

This edition, the largest ever issued, contains 1048 pages of technical text grouped in 50 chapters under the following headings: fundamentals, human reaction, heating and cooling loads, combustion and consumption of fuels, systems and equipment, special systems, instruments, and codes. An elaborate cross index is included.

In addition to technical data, the guide contains more than 400 pages presenting products of prominent manufacturers who supply equipment for heating, ventilating, and air conditioning.

Symbols for use in drawing plans now conform with those recently adopted by the American Standards Asssn. The reference list of codes and standards includes 133 codes and gives names and addresses of organizations which can supply them.

Price: $7.50 postpaid.

PROPOSED STATE BUILDING CONSTRUCTION CODE Applicable to One- and Two-Family Dwellings—New York Building Code Commission, 1740 Broadway, New York 19. This code is expressed in terms of required performance and states the criteria by which conformity with the requirements shall be tested. It covers conventional wood construction and, under "plumbing, heating, electrical, and other equipment standards": gas piping; warm air heating systems; heat-producing appliances; chimneys, flues, and gas vents. To assist in interpreting, applying, and enforcing the code, an extensive manual has been prepared to accompany it.

STUDY OF FUNDAMENTALS OF DESIGN of Non-Primary Aerated Blue Flame Gas Burners—AGA Laboratories Research Bulletin 62. The studies were conducted as Project DGR-14-GU, a PAR activity.

Studies involving several variations of two basic types of non-primary aerated blue flame burners made for the purpose of determining the influence of design factors on performance indicated that both types could be operated on any fuel gas within various gas pressure limits which controlled input rates. With proper control of gas pressure their performance at full input rate on any one gas in a contemporary range and water heater was as satisfactory as that obtained with the Bunsen type burners originally supplied with the appliances, although the non-primary aerated burners required different designs for natural and manufactured gases. Certain limitations were also encountered with impingement target burners on natural

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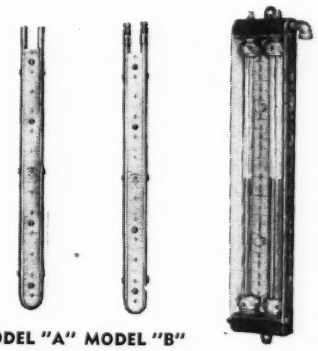

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The Kelley-Snyder (Texas) gasoline plant being constructed by Sunray Oil Corp. will go on stream July 1 with a capacity of 70 MMcf per day. When this photo, showing the suction header, interstage gas coolers, and compressor station, was taken, construction was past the half-way mark toward completion. Fifty-five thousand feet of 8-in. and smaller pipe is going into the installation.

gas at low turn-down rates. Non-primary aerated burners employing slotted ports were indicated as fundamentally adapted for use with fast burning gases, whereas impingement target designs were more suitable for use with slower burning gases. These latter designs permitted the employment of relatively large size gas ports with blue flame combustion. Studies were also made of non-primary aerated impingement flame target burners as contrasted with the more common burner designs utilizing primary aerated or Bunsen type flames and employing flame spreaders or flame retaining devices.

Materials of construction for gas ports and impingement target surfaces of non-primary aerated burners should consist of heat and corrosion resisting metals or ceramics for trouble-free operation and long service life. Burner ports constructed of materials having low thermal conductivity are effective in reducing high burner head temperatures where the flames are on the ports. A procedure consisting of locating burner ports outside the combustion chamber proper proved effective in removing the ports from regions of high ambient temperature and in providing for cooling of the burner head by combustion air with the ports shielded from excessive drafts. Ports of burners which operate with a lifting flame and which employ impingement targets are usually subjected to less severe temperature conditions and may therefore be fabricated of ordinary materials such as iron or brass.

Primary advantages of non-primary aerated burners with flames on the ports are compactness of size, elimination of primary air openings, mixer tubes, and orifices, complete absence of flashback and noise of extinction tendencies, large gas turndown ratios, and quiet operation. Disadvantages include need for careful selection of materials of construction, close tolerances in manufacture, and possibilities of plugging of small ports with gum, carbon, or foreign matter. In applying such burners, consideration should be given to such usual items as the need for protection against excessive drafts, gas pressure and composition fluctuations, temperatures causing major reductions in input rate, and flame carry-over in the event of a blocked port.

Impingement target burners were found to possess essentially the same advantages and disadvantages except that they normally have lower gas turndown ratios and are somewhat noisy in operation. They have the added advantage of employing larger gas ports of the order of magnitude of 36 DMS so that possibilities of plugging by gum, carbon, or dust are minimized but the usual items listed in the preceding paragraph should be considered.

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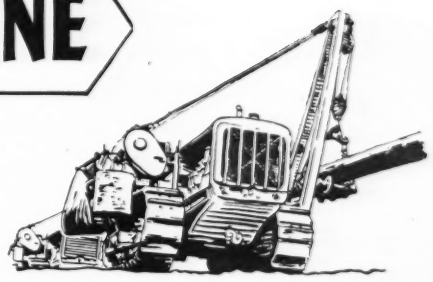
PROGRESS ON THE PIPELINE



OVER $3/4 BILLION— BUDGET FOR PIPELINE CONSTRUCTION IN 1951

Forty-six gas transmission companies have set aside $786,394,640 for work planned, authorized, or under construction in 1951. Total mileage planned runs to 13,643 miles; additions to existing compressor stations, construction of stations aggregate 736,275 hp.

1. NIAGARA MOHAWK POWER CORP. Syracuse, is planning to build seven laterals: one from Fulton to Watertown, N.Y., the other six from points on New York State Natural Gas Corp.'s Ithaca-to-Albany line to Utica, Herkimer, Canajoharie, Amsterdam, Schenectady, and Albany. Total mileage of the 6- to 16-in. lines will be 80.7. Cost is $2,967,500.

2. EAST TENNESSEE NATURAL GAS CO., Knoxville, will build about 200 miles of main and 100 miles of laterals this year, as part of its expansion program which will cost between $7 million and $8 million. Lines planned for this year will extend from the firm's main lines to a number of Tennessee cities; a 100-mile, 16-in. line will be built from a compressor station near Knoxville to Kingsport; and the latter line will be extended to Bristol with a 21-mile, 6⅝-in. line.

3. ATLANTIC GULF GAS CO., Shreveport, wants to build 1708 miles of line, including 28,000 compressor horsepower, to be installed at four new stations. The program is estimated to cost $98 million. The new line will extend from Pointe a la Hache, La., through Alabama and Georgia to Georgetown, S. C. Many laterals and branches are planned, including several into northern Florida.

4. PANHANDLE EASTERN PIPE LINE CO., Kansas City, will build 129.1 miles of 30-in. and 43 miles of 26-in. loops in Illinois, Indiana, Ohio, and Michigan and will install 14,000 hp in three compressor stations—4000 at Tuscola, Ill., 6000 at Zionsville, Ind., and 4000 at Edgerton, Ohio. No new cities will be served.

5. COAST COUNTIES GAS & ELECTRIC CO., San Francisco, plans to build five miles of 8-in. line from Walnut Creek to Danville. This will cost $99,500 and is designed to reduce pressure requirements of the system from 140 to less than 100 psi. A 2⅓-mile, 10-in. line will be laid from Lafayette to an existing line. It will deliver an additional 4100 Mcf daily to the town and will cost $72,000. No new towns will be served.

6. KANSAS - NEBRASKA NATURAL GAS CO., INC., Hastings, Neb., as part of its $7.2 million program for 1951 will build a new 2000-hp compressor station and dehydration plant near Holcomb, Kan.; add a 2000-hp engine at the Palco, Kan., station; build a 1000-hp station near Grand Island, Neb.; and add cooling equipment at the Scott City, Kan. station. Other projects planned for the year include (1) 22¼ miles of 12¾-in. line from the Holcomb station to replace 20¼ miles of 6⅝-in.; (2) 16 miles of 12¾-in. loop northeast from Wakeeney, Kan.; (3) 34½ miles of 12¾-in. to replace 8⅝- and 6⅝-in. in Palco-to-Phillipsburg line; (4) 10 miles of 12¾-in. to replace 8⅝-in. pipe in Alma-to-Holdrege, Neb. line; (5) 5 miles of 10¾-in. and 54 miles of 8⅝-in. from Grand Island to Albion, Neb.; (6) 26 miles of 3½-in. and 25½ miles of 2⅜-in. lateral to serve eight Nebraska towns; (7) 40 miles of 6⅝-in. from Albion to Norfolk, Neb.; (8) 26½ miles of 3½-in. and 35½ miles of 2⅜-in. lateral to serve nine Nebraska towns; (9) 27 miles of 6⅝-in. line from Albion to Neligh, Neb.; and (10) 10 miles of 2⅜-in. lateral to serve four Nebraska towns.

7. CITIES SERVICE GAS CO., Oklahoma City, will spend $10,225,000 during 1951 to build 314 miles of line in Kansas and to install 13,080 hp at four new compressor stations, two in Kansas, one in Missouri, and one in Oklahoma. The line to be built includes a section from near Wichita to Hesston, Kan., and a gathering system at Hugoton, Kan.

8. COLORADO INTERSTATE GAS CO., Colorado Springs, plans to build a line from its Kit Carson (Colo.) compressor station through Oklahoma to a new 6600-hp compressor station to be built in the Amarillo gas field in Texas. The 20-in. line will be about 215 miles long.

9. THE EAST OHIO GAS CO., Cleveland, will improve its service to the Cleveland area by building a 65-mile, 26-in. line from near Petersburg, Ohio, to Cleveland at an estimated cost of $4.4 million. Primary purpose of the line will be to supplement the supply of gas from underground storage areas owned by affiliates of East Ohio in Pennsylvania and New York.

10. JERSEY CENTRAL POWER & LIGHT CO., Asbury Park, is under way on a 1951 program which will cost $1,925,000. About 68 miles of line will be laid during the year—1.6 miles of 4-in. from Whippany to Denvil, 37.5 miles of 10-in. from New Brunswick to Long Branch, and 28.75 miles of 8-in. from Estellville to Cape May and Sea Isle City. The latter two lines have already been completed. Areas to benefit include Monmouth, Ocean, Cape May, and Morris counties.

11. KANSAS-COLORADO UTILITIES INC., Lamar, Colo., will install 27 miles of 4-in. line in Prowers county this year. A 19-mile section will run from Kornman to Bristol and an 8-mile line from near Hartman to Holly.

12. LONE STAR GAS CO., Dallas, will complete a number of short additions to its system during 1951. They include (1) 9.8 miles of 8-in. in Tom Green county and 3.1 miles of 6-in. north from Carlsbad in the same county; (2) 20 miles of 10-in. from Silver to Maryneal and 18 miles of 16-in. north from there to Sweetwater; (3) 11.9 miles of 4-in., mostly in Jones county; (4)

1 NIAGARA MOHAWK POWER CORP.
2 EAST TENNESSEE NATURAL GAS CO.
3 ATLANTIC GULF GAS CO.
4 PANHANDLE EASTERN PIPE LINE CO.
5 COAST COUNTIES GAS & ELECTRIC CO.
6 KANSAS-NEBRASKA NATURAL GAS CO. INC.
7 CITIES SERVICE GAS CO.
8 COLORADO INTERSTATE GAS CO.
9 THE EAST OHIO GAS CO.
10 JERSEY CENTRAL POWER & LIGHT CO.
11 KANSAS-COLORADO UTILITIES INC.
12 LONE STAR GAS CO.
13 MICHIGAN-WISCONSIN PIPE LINE CO.
14 NEW YORK STATE NATURAL GAS CORP.
15 NORTHEASTERN GAS TRANSMISSION CO.
16 UNITED NATURAL GAS CO.
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19 NORTHERN INDIANA FUEL & LIGHT CO.
20 TEXAS EASTERN TRANSMISSION CORP.
21 HOPE NATURAL GAS CO.
22 TEXAS GAS TRANSMISSION CORP.
23 TENNESSEE GAS TRANSMISSION CO.
24 LAKE SHORE PIPE LINE CO.
25 MICHIGAN GAS STORAGE CO.
26 SHENANDOAH GAS CO.
27 TRANSCONTINENTAL GAS PIPE LINE CORP.
28 ARKANSAS WESTERN GAS CO.
29 SOUTHWESTERN VIRGINIA GAS CO.
30 NORTHWEST NATURAL GAS CO.
31 MONTANA POWER CO.
32 TRUNKLINE GAS CO.
33 UNITED GAS CORP.
34 AMERE GAS UTILITIES CO.
35 ATLANTIC SEABOARD CORP.
36 CENTRAL KENTUCKY NATURAL GAS CO.
37 UNITED FUEL GAS CO.
38 PACIFIC GAS & ELECTRIC CO.
39 MIDSOUTH GAS CO.
40 MANUFACTURERS LIGHT & HEAT CO.
41 SOUTHERN CALIFORNIA GAS CO.
42 GEORGIA NATURAL GAS CO.
43 CAROLINA NATURAL GAS CORP.
44 EL PASO NATURAL GAS CO.
45 SOUTHEASTERN MICHIGAN GAS CO.
46 NEVADA NATURAL GAS CO.

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Aggregate Horsepower 736,275
Cost. $786,394,640

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THE NATION'S PIPELINES

RECORD BREAKING PACE IN '51

15 miles of 4-in. from near Kerrville through Center Point to Bandera; (5) 9.5 miles of 4-in. from Hearne to Franklin; (6) 14.8 miles of 6-in. in Brazos county; (7) 9.1 miles of 8-in. from Madisonville southeast into Walker county; (8) 6 miles of 10-in. and 2 miles of 12-in. south from near Fairfield; (9) 4 miles of 3-in. to Whitehouse in Smith county; (10) 5.6 miles of 6-in. in the southeast corner of Hopkins county; 6.7 miles of 10-in. and 3.65 miles of 16-in. in Denton county; and (11) about 60 miles of line from Fort Worth northwest to near Stewarton and Hansley. Total line to be built is about 200 miles.

13. MICHIGAN - WISCONSIN PIPE LINE CO., Detroit, plans no pipeline construction for 1951 but is continuing construction of compressor stations, which will probably be completed by September. They include the following: in Oklahoma—Guymon, 19,200 hp; Kansas—Meade, 7920; Sterling, 7920; Enterprise, 7920; Missouri—Maitland, 8400; Iowa—Fairfield, 8400; Illinois—New Windsor, 8400; Woodstock, 6000; Indiana—Crown Point, 6000; Michigan—Bridgman, 6000; Hamilton, 6000.

14. NEW YORK STATE NATURAL GAS CORP., Pittsburgh, is building seven pipelines totaling 328 miles and is installing three compressor stations with an aggregate of 28,900 hp. The stations, to cost $9.7 million, are Oakford near Delmont, 12,500 hp; South Bend near Shelocta, 12,000 hp; and Sabinsville, 4400 hp. The lines include (1) 23 miles of 16- and 20-in. loop from the firm's Preston station to its Gibson station; (2) 4 miles of 16-in. loop from near Murrysville, Pa., to the Tonkin station; (3) 51 miles of 20-in. loop from Allegheny river near New Kingston to the Pennsylvania-Ohio state line; (4) 26 miles of 20-in. from the Allegheny river near Kensington to the South Bend storage pool; (5) 23 miles of 20-in. loop from State Line station to Angelica, N. Y.; (6) 37 miles of 20-in. loop from Boom station to Cayuta, N. Y.; and (7) 164 miles of 16- and 20-in. from near Ithaca to Albany, N. Y. These seven projects will cost an estimated $17,436,000.

15. NORTHEASTERN GAS TRANSMISSION CO., Springfield, Mass., has planned a 1951 program which will cost some $26 million. A 16-in. main line will be built in Connecticut to enable the company to receive gas from Transcontinental, and a 24-in. line in Massachusetts will take Tennessee Gas Transmission Co. gas. Together, these lines total 255 miles. In addition, Northeastern will build 265 miles of laterals to serve cities in Connecticut, Massachusetts, and New Hampshire.

16. UNITED NATURAL GAS CO., Oil City, Pa., plans installation of 8 miles of reconditioned 12-in. pipe between compressor stations in Elk and McKean counties, Pa., at a cost of $195,000; 7 miles of 8-in. line in Elk and Cameron counties for $174,000; and some miscellaneous construction such as emergency by-pass lines, relocations, replacements, and exchange of 600 hp between existing stations because of pumping station requirements.

17. NORTHERN NATURAL GAS CO., Omaha, plans to build a new 8800-hp compressor station at Burdett, Kan. this year and to make additions at the following stations: Texas—Sunray, 4800 hp; Kansas—Sublette, 3200; Mullinville, 4800; Bushton, 11,200; Clifton, 9600; Nebraska—Beatrice, 4800; Palymra, 6400; Iowa—Oakland, 4800; Ogden, 6400; and Ventura, 6400. About 310 miles of 26-in. line will be built in sections at the following locations: about 30 miles southwest from St. Paul, Minn.; from the Palmyra, Neb. compressor station to Miltonville, Kan.; from Bushton, Kan. station to Macksville and from Mullinville, Kan. station some 20 miles south; from Beaver, Okla. station about 30 miles into northeastern Texas. The year's construction budget totals $60 million.

18. TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago, will spend $128,286,800 during 1951. The firm plans to build 1408 miles of 20- and 30-in. line from the La Gloria field in Texas through Arkansas and Missouri to Volo, north of Joliet, Ill. Five compressor stations, totaling 50,000 hp, will be installed along the line this year—two in Texas, two in Arkansas, and one in Illinois. The line will carry gas to be sold to nine utilities.

19. NORTHERN INDIANA FUEL & LIGHT CO., Auburn, will build a 31-mile line from Edgerton to Auburn, Ind. at an estimated cost of $511,315. Service will be extended to four new towns, and five that were previously served will benefit.

20. TEXAS EASTERN TRANSMISSION CORP., Shreveport, plans to spend $14,310,000 in building 826 miles of pipeline from Kosciusko, Miss. to the Oakford storage field in Pennsylvania and installing 98,900 hp in seven stations on the new line and six stations to be added to the firm's present system east of Connellsville, Pa. The 30-in. line will extend from Kosciusko through northwestern Alabama, Tennessee, Kentucky, and southeastern Ohio to Connellsville. From there another 30-in. section will extend to the Oakford field.

21. HOPE NATURAL GAS CO., Clarksburg, W. Va., has a $1 million program which includes the addition of about 43 miles of line from Fairmont to Morgantown, W. Va., and from there to the Terra Alta producing field.

22. TEXAS GAS TRANSMISSION CORP., Owensboro, Ky., will spend $46.6 million for construction of 614 miles of 26-in. line and addition of 14,620 hp. A new 3960-hp station is to be built near Shreveport, and these additions will be made at existing stations: 3520 hp at Bastrop, La.; 1320 at Slaughters, 3000 at Hardinsburg, and 1500 at Jeffersontown, all in Kentucky; and 5280 at Dillsboro, Ind. In central Louisiana, north of Alexandria, 189 miles of 26-in. line is to be installed. A new 189-mile line will be built from the North Tepetate field in Louisiana to the Bastrop station, and the firm's line will be looped from there to a point southwest of the Slaughters station. Other loops are to be installed as follows: 23 miles from Slaughters northeast; and 13 miles from the Hardinsburg station.

23. TENNESSEE GAS TRANSMISSION CO., Houston, has planned three new lines and 11 loops for installation this year. Three new compressor stations will be built—near Albany and Cambridge, Ohio, and Hamburg, N. Y.—and seven existing stations are to be enlarged. In all, 54,500 hp will be added. The following lines are to be built: (1) 24 miles of 26-in. loop with northern terminus near Falfurrias, Texas; (2) 30 miles of 30-in. loop from 13 miles southwest of Victoria, Texas, to 17 miles northeast of Victoria; (3) 22 miles of 24-in. line from the Hudson river to the N. Y.-Mass. state line near Pittsfield, Mass.; (4) 40 miles of 30-in. loop from Cypress, Texas, to near Fostoria; (5) 30 miles of 30-in. loop from Woodville to Jasper, Texas; (6) 43 miles of 30-in. loop, Sabine river to Natchitoches, La.; (7) 47 miles of 30-in. loop, West Monroe to Mer Rouge, La.; (8) 93 miles of 30-in. loop from Drew to Holly Springs, Miss.; (9) 30 miles of 30-in. loop, Meader to Cove City, Ky.; (10) 37 miles of 30-in. loop, Cabe to Lebanon, Ky.; (11) 59 miles of 30-in. loop, Parsons to Dickson, Tenn.; (12) 62 miles of 30-in. loop Richmond to Salt Lick, Ky.; (13) 150 miles of 24-in. line from near Buffalo to near Syracuse, N. Y.; and (14) 125 miles of 24-in. line from Syracuse to the Hudson river.

24. LAKE SHORE PIPE LINE CO., Ashtabula, Ohio, plans to build a 45-mile, 10¾-in. line from nine miles southeast of Meadville, Pa., to Ashtabula.

25. MICHIGAN GAS STORAGE CO., Jackson, is spending $4.5 million to lay 95 miles of line and install 4400 hp at the Muskegon river compressor station. The line will extend from near Laingsburg to Mt. Clemens with laterals to points near Pontiac and Warren.

26. SHENANDOAH GAS CO., Lynchburg, Va., has planned to construct a line from near Strasburg, Va. to Martinsburg, W. Va.

27. TRANSCONTINENTAL GAS PIPE LINE CORP., Houston, will build two extensions to its system this year—a 27-mile line across Westchester county to New England and an 11-mile lateral across Staten Island and New York harbor to Brooklyn. Two river crossings will be started during 1951—the second Hudson crossing on the New England extension and the Narrows crossing in New York harbor on the Staten Island section. Various compressor stations from Texas through central North Carolina will receive an additional 45,675 hp during the year. The above projects will cost an estimated $19 million. In addition, Transco is planning to build 500 miles of loop, some of which will be started in 1951. Engineering on the design and location of this loop is not completed.

28. ARKANSAS WESTERN GAS CO., Fayetteville, Ark., will spend $300,000 for the installation of 21 miles of line. An 11-mile, 8-in. line is planned from the Lone Elm field northeast to an existing line, and a 10-mile, 6-in. line will extend from a point near Tontitown to the Ozark White Lime Co. between Springdale and Fayetteville. No new towns will be served.

29. SOUTHWESTERN VIRGINIA GAS CO., Martinsville, Va., plans to build a

SOUTHERN PINE trees along Texas-Illinois Natural Gas Pipeline Co.'s right of way fall before the whirling blade of this tree "feller."

$230,000, 16.8-mile line from Martinsville to a point on the Transcontinental line near Danville, Va. The new line will be of 4½-in. pipe.

30. NORTHWEST NATURAL GAS CO., New York, has a project pending which will cost $103,160,000. Its line would extend from Portland to Vancouver, Seattle to Spokane with a lateral to Hanford, and on to Alberta with several short extensions in Canada. Total mileage is estimated at 1455, with 48,600 hp to be installed.

31. MONTANA POWER CO., Butte, expects to build a 50-mile line from a point five miles west of its Cut Bank compressor station northeast to the Canadian border. Installation of 600 hp also is planned. The company's present system will benefit from the program.

32. TRUNKLINE GAS CO., Houston, will spend $81.5 million this year for a 1294-mile line from McAllen, Texas to near Decatur, Ill. Five compressor stations, aggregating 32,000 hp, will be built: Louisiana—Longville and Epps; Mississippi—Independence; Illinois—Joppa and Tuscola.

33. UNITED GAS CORP., Shreveport, plans to build more than 1000 miles of line at a cost of about $111 million. One line will extend from the Agua Dulce field in Texas to Sterlington, La., with a compressor station to be installed at Needville and capacity to be added at Refugio, Edna, Goodrich, and Magasco. From Tom O'Connor field in Texas a line will be built to the Dupont Co. plant near the Louisiana state line, with a lateral to Dow Chemical Co. at Freeport. A third line will run north to Kosciusko, Miss., from some 28 miles into the Gulf of Mexico, with laterals to Baxterville, Miss., field and in Louisiana to the Grand Bay, West Bay, Venice, and Livette fields. On the latter line, compressor stations will be constructed at Verna, Miss., and Livingston and Lafayette, La. Total mileage of line to be built in each state is about 319 in Texas, 430 in Louisiana, and 200 in Mississippi. About 63,000 hp will be installed.

34. AMERE GAS UTILITIES CO., Beckley, W. Va., will build 16½ miles of 8⅝-in. line from Princeton, W. Va., to a point on Atlantic Seaboard Corp.'s line and a 15.1-mile, 8⅝-in. line from Atlantic's nearby Flat Top compressor station to Beckley.

35. ATLANTIC SEABOARD CORP., Charleston, will install 3520 hp at a new Files Creek compressor station at Beverley, W. Va.

36. CENTRAL KENTUCKY NATURAL GAS CO., Charleston, plans to build 18.6 miles of 12-in. loop from Winchester to Lexington, and 12.8 miles of 20-in. loop between Means and Foster, all in Kentucky.

37. UNITED FUEL GAS CO., Charleston, will install 2640 hp at new Lanham (W. Va.) compressor station and will build 28 miles of 20-in. line from the new station to its Cobb compressor station. Cost of the construction proposed by companies 34, 35, 36 and 37, all members of the Charleston Group, Columbia Gas System, is $6,520,525.

38. PACIFIC GAS & ELECTRIC CO., San Francisco, will complete its Super Inch line with the installation of three compressor stations, aggregating 44,820 hp and costing $12,059,000. The California stations with their installed horsepower are Topock, across the Colorado river from Topock, Ariz., 15,000; Hinkley, 17,500; and Kettleman Hills, 12,320. The company's northern and central California markets will benefit.

39. MIDSOUTH GAS CO., Little Rock, has a $7 million 1951 program for the installation of 197 miles of line. A section from Helena to near Forrest City, Ark., is already under way, and other sections will extend east and north from there to Wynne, and southwest to Brinkley with a lateral to Cotton Plant. Another line will run south from Truman through Marion and will cross the Mississippi just south of Memphis, Tenn. A section will run west from Marion to Parkin, and there will be another line from Marked Tree to Lepanto. No compressor additions are planned.

40. MANUFACTURERS LIGHT & HEAT CO., Pittsburgh, plans to build 172 miles of line from a point north of Lock Haven in Clinton county, southwest across the Youghiogheny and Monongahela rivers south of Pittsburgh, and west to near Canonsburg, Pa. The line, to include 16-, 20-, and 24-in. pipe, would cost $9,613,000.

41. SOUTHERN CALIFORNIA GAS CO., Los Angeles, plans to construct a 23-mile, 30-in. line on the west side of Los Angeles and a 22-mile, 22-in. line southeast from the La Goleta storage field. The first line will cost $2 million, the second $1,260,000 for a 1951 total of $3,260,000.

42. GEORGIA NATURAL GAS CO., Albany, Ga., plans to spend $7.5 million to build 340 miles of line from Tallahassee, Fla. through Americus, Ga. to Columbus, with branches to Vienna, Cordele, Moultrie, Bainbridge, Cairo, and Valdosta, all in Georgia.

43. CAROLINA NATURAL GAS CORP., Charlotte, N. C., wants to build 100 miles of line in North and South Carolina at a cost of $1,450,000. The lines would extend from connections with Transcontinental Gas Pipe Line Corp.'s line. Cities slated for service include Hickory, Lenoir, Newton, Granite Falls, Conover, Lexington, and Thomasville, N. C. and Rock Hill, S. C.

44. EL PASO NATURAL GAS CO. will construct about 451 miles of 24-in. main line plus gathering and lateral lines. The additions will extend from near Topock, Ariz. on the California border across Arizona to the San Juan, N. M. vicinity. Laterals will be built to Prescott, Winslow, and Holbrook, Ariz.; Gallup, Farmington, Aztec, and Blanco, N. M. Installation of 10,100 hp in three new stations is planned. They will be Navajo, Ariz., 5000 hp; San Juan River, N. M., 4200 hp; and Angel Peak, N. M., 900 hp.

45. SOUTHEASTERN MICHIGAN GAS CO., Port Huron, Mich., will spend $1.7 million to construct 55 miles of 12-in. line to take natural gas from the Panhandle station at Clauson, Mich. to Port Huron. Cities to be served include Port Huron, Marysville, St. Clair, Marine City, Algonac, New Baltimore, New Haven, Romeo, Armada, Richmond, and Memphis.

46. NEVADA NATURAL GAS CO., Las Vegas, is planning to construct 122 miles of 10¾-in. line taking off from El Paso Natural Gas Co.'s line at Topock, Ariz. and extending to Las Vegas, Nev. It would serve Needles, Calif., Boulder City, Henderson, and a U. S. Gunnery School, in Nevada, en route.

CITIES SCHEDULED TO RECEIVE THEIR FIRST NATURAL GAS SERVICE

This list of cities has been compiled from the map on pp. 96-97. Some of those listed are included in applications which have not been approved by the FPC. Population figures are based on the 1940 census.

Alabama

Alexander City	6640
Andalusia	6886
Ashland	1608
Brundidge	1909
Butler	670
Clayton	1813
Dothan	17,194
Enterprise	4353
Headland	2052
Linden	1203
Lineville	1300
Maplesville	456
Opp	3178
Ozark	3601
Roanoke	4168
Rockford	394
Thomaston	345
Troy	7055
Wadley	493
Wedowee	525

Arizona

Flagstaff	5080
Holbrook	1184
Prescott	6018
Winslow	4577

Arkansas

Brinkley	3409
Crawfordsville	612
Cotton Plant	1689
Earle	2062
Forrest City	5699
Helena	8546
Lepante	1195
Marianna	4449
Marion	758
Marked Tree	2685
Palestine	345
Paragould	7079
Parkin	1412
Trumann	3381
Tyronza	639
West Helena	4517
West Memphis	3369
Wheatley	362
Wynne	3633

California

Needles	3624

Connecticut

Bridgeport	147,121
Danbury	22,339
Derby	10,287
Greenwich	5981
Hartford	166,267
New Britain	68,685
New Haven	160,605
New London	30,456
Norwalk	39,849
Norwich	23,650
Putnam	7775
Stamford	47,938
Stonington	1826
Torrington	26,988
Wallingford	11,425
Waterbury	99,314
Willimantic	12,101
Winsted	7674

Delaware

Newark	4502
New Castle	4414
Wilmington	112,504

Florida

Bonifay	1924
Chattahoochie	3000
Chipley	2167
Fernandina	3492
Havana	1221
Jacksonville	173,065
Jamieson	169
Marianna	5079
Panama City	11,610
Port St. Joe	2393
Quincy	3888
St. Marks	338
Tallahassee	16,240
Tyndall Air Base	

Georgia

Albany	19,055
Americus	9281
Ashburn	2266
Attapulgus	315
Bainbridge	6352
Blackshear	2010
Bowman	634
Brunswick	15,035
Buford	4191
Cairo	4653
Camilla	2588
Commerce	3294
Cordele	7929
Covington	3900
Dawson	3681
Douglas	5175
Dublin	7814
Eastman	3311
Elberton	6188
Fitzgerald	7388
Gainesville	10,243
Hartwell	2372
Helena	1073
Jefferson	1839
Lavonia	1667
Lawrenceville	2223
Lyons	1900
McRae	1595
Metter	1823
Monroe	4168
Moultrie	10,147
Ocilla	2124
Quitman	4450
Royston	1549
St. Mary's	733
Savannah	95,996
Statesboro	5028
Sugar Hill	599
Thomasville	12,683
Tifton	5228
Toccoa	5494
Valdosta	15,595
Vidalia	4109
Vienna	2063
Waycross	16,763
Winder	3974

Illinois

Bloomington	32,868
Centralia	16,343
Metropolis	6287
Mt. Vernon	14,724
Normal	6983
Paxton	3106

Indiana

Grabill	288
Harlan	500
Leo	300
Woodburn	471

Louisiana

Pointe a la Hache	515
Morganza	744

Massachussetts

Arlington	40,013
Athol	11,180
Beverly	25,537
Boston	770,816
Brockton	62,343
Cambridge	110,879
Dedham	15,508
East Braintree	5300
Fall River	115,428
Fitchburg	41,824
Glouster	24,046
Haverhill	46,752
Holyoke	53,750
Hyannis	1800
Hyde Park	2000
Lawrence	84,323
Leominster	22,226
Lowell	101,389
Lynn	98,123
Malden	58,010
Milford	15,388
New Bedford	110,341
North Adams	22,213
Northampton	24,794
Norwood	15,383
Pittsfield	49,684
Plymouth	13,100
Revere	34,405
Salem	41,213
Spencer	6641
Springfield	149,554
Taunton	37,395
Webster	13,186
Westfield	18,793
Worcester	193,694

Michigan

Algonac	1931
Armada	865
Marine City	3633
Marysville	1777
Memphis	630
New Baltimore	1434
New Haven	904
Port Huron	32,759
Richmond	1722
Romeo	2637
St. Clair	3471

Mississippi

Bay St. Louis	4138

Nebraska

Albion	2268
Battlecreek	702
Belgrade	406
Cedar Rapids	695
Elgin	853
Fullerton	1707
Genoa	1231
Humphrey	841
Lindsay	332
Madison	1812
Meadowgrove	479
Neligh	1796
Newman Grove	1036
Norfolk	10,490
Oakdale	561
Palmer	516
Petersburg	657
St. Edward	893
St. Paul	1571
Stanton	1526
Tilden	984

Nevada

Boulder City	3000

New Hampshire

Concord	27,171
Manchester	77,685
Nashua	32,927

New Jersey

Asbury Park[1]	14,617
Atlantic City[2]	64,094
Atlantic Highlands	2335
Elizabeth[3]	109,912
Freehold Borough	6952
Highlands	2076
Holmdel	250
Keansburg	2904
Keyport	5147
Madison	7944
Marlboro	500
Matawan	2758
Middletown	11,018
Newark[4]	429,760
Phillipsburg	18,314
Raritan	4839
Rumson	2926
Union Beach	1893

New Mexico

Gallup	7041

New York

Albany	130,577
Amsterdam	33,329
Brooklyn	2,698,285
Canajoharie	2577
Cohoes	21,955
Glens Falls	18,836
Gloversville	23,329
Herkimer	9617
Johnstown	10,666
Little Falls	10,163
Mineola[5]	10,064
New York	7,454,995
Rensselaer	10,768
Rome	34,214
Saratoga Springs	13,705
Schenectady	87,549
Troy	70,304
Utica	100,518
Watervliet	16,114

North Carolina

Asheville	51,310
Chapel Hill	3654
Concord	15,572
Conover	1195
Dallas	1704
Durham	60,195
Erlanger	1400
Gastonia	21,313
Granite Falls	1873
Hickory	13,487
Leaksville	1886
Lenoir	7598
Lexington	10,550
Lincolnton	4525
Maiden	1803
Morganton	7670
Newton	5407
Raleigh	46,897
Reidsville	10,387
Statesville	11,440
Thomasville	11,041
Valdese	2615

[1]And surrounding towns served by Jersey Central Power & Light Co.
[2]And surrounding towns served by South Jersey Gas Co.
[3]And surrounding towns served by Elizabethtown Consolidated Gas Co.
[4]And surrounding towns served by Public Service Electric & Gas Co.
[5]And surrounding towns served by Long Island Lighting Co.

Ohio

Amboy	500
Ashtabula	21,405
Conneaut	9355
Fairpoint	1000
Geneva	4171
Geneva-on-the-Lake	172
Grand River	305
Jefferson	1676
Lakeville	144
Madison	979
Mentor	1827
North Perry	318
Painesville	12,235
Perry	645
Wickliffe	3155
Willoughby	4364
Willowick	915

Oregon

Portland	305,394

Pennsylvania

Chambersburg	14,852

Rhode Island

Bristol	11,159
Newport	30,532
Pawtucket	75,797
Providence	253,504
Warren	8,158
Westerly	11,199

South Carolina

Anderson	19,424
Andrews	2008
Beaufort	3185
Charleston	2500
Gaffney	7636
Georgetown	5559
Rock Hill	15,009
Summerville	3023
Walterboro	3373

Tennessee

Benton	550
Bristol	14,004
Carthage	1512
Cookeville	4364
Cowan	1461
Crossville	1511
Elizabethton	8516
Erwin	3350
Greeneville	6784
Harriman	5620
Jefferson City	2576
Johnson City	25,332
Kingsport	14,404
Lawrenceburg	3807
Lebanon	5950
Madison	900
Manchester	1715
Mascot	1800
Morristown	8050
Murfreesboro	9495
Old Hickory	8000
Oliver Springs	855
Pulaski	5314
Richard City	1008
Rockwood	3981
Rogersville	2018
South Pittsburgh	2285
Waynesboro	768
Winchester	2760

Texas

Bandera	470
Boonsville	125
Center Point	500
Franklin	1087
Silver	
Springtown	500
Stewarton	
Whitehouse	500

Virginia

Danville	32,749
Martinsville	10,080
Winchester	12,095

Washington

Bellingham	29,314
Everett	30,224
Hanford	250
Olympia	13,254
Seattle	368,302
Spokane	122,001
Tacoma	109,408
Wenatchee	11,620

West Virginia

Beckley	12,852
Blairton	
Martinsburg	15,063
North Mountain	100
Princeton	7426

DOWELL magnesium anodes

provide effective corrosion control on distribution piping systems with negligible "interference"

Cathodic protection to control corrosion on complicated municipal gas and water distribution systems poses the problem of "cathodic interference." This occurs where current from a protected system is of such high voltage that it imposes itself on a neighboring unprotected system and accelerates corrosion.

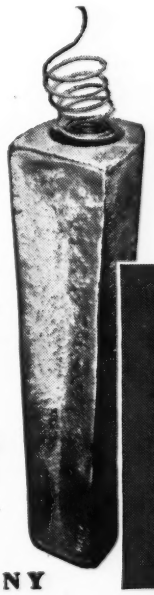
When Dowell magnesium anodes are used to provide the current for cathodic protection, such interference is negligible. The driving voltage of magnesium, approximately 1 volt negative, is sufficient to give protection in most cases, yet low enough so that interference with neighboring systems is minimized. Dowell magnesium anodes can provide effective corrosion control—and still be "good neighbors"!

Dowell magnesium anodes provide real advantages in economy, too. They are easily installed and require no external source of power. A recent application of magnesium anodes to a gas distribution system showed that, on one section, new leaks were cut from 24 in *one* year to only 3 in *five* years, with a 96% saving in leak repair expenses. Costs involved indicated that it is possible to maintain complete cathodic protection for less than $10.00 per year per mile of 3 inch, or equivalent, pipe.

Call the nearest Dowell office or write to Tulsa for more information on this economical, effective and highly practical means of cutting your corrosion costs.

DOWELL INCORPORATED, *Tulsa 3, Oklahoma*

OFFICES IN PRINCIPAL CITIES



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Look to **DOWELL**

MAGNESIUM ANODES FOR CORROSION CONTROL

SUBSIDIARY OF THE DOW CHEMICAL COMPANY

COMPRESSOR STATIONS TO BE CONSTRUCTED OR AUGMENTED

TOTAL HORSEPOWER: 736,275

Atlantic Gulf Gas Co., Shreveport
4 new stations—28,000 hp

Panhandle Eastern Pipe Line Co., Kansas City
3 new stations—14,000 hp
Tuscola, Ill. ..... 4000 hp
Zionsville, Ind. ..... 6000 hp
Edgerton, Ohio ..... 4000 hp

Kansas-Nebraska Natural Gas Co., Inc., Hastings, Nebraska
2 new stations—3000 hp
Holcomb, Kan. ..... 2000 hp
Grand Island, Neb. ..... 1000 hp
Additions:
2000-hp engine at Palco, Kan. station
Cooling equipment at Scott City, Kan. station

Cities Service Gas Co., Oklahoma City
4 new stations—13,080 hp
Two in Kansas, one in Missouri, one in Oklahoma

Colorado Interstate Gas Co., Colorado Springs
1 new station—6600 hp
To be built in the Amarillo, Texas gas field

Michigan-Wisconsin Pipe Line Co., Detroit
11 new stations—92,160 hp
Guymon, Okla. ..... 19,200 hp
Meade, Kan. ..... 7920 hp
Sterling, Kan. ..... 7920 hp
Enterprise, Kan. ..... 7920 hp
Maitland, Mo. ..... 8400 hp
Fairfield, Iowa ..... 8400 hp
New Windsor, Ill. ..... 8400 hp
Woodstock, Ill. ..... 6000 hp
Crown Point, Ind. ..... 6000 hp
Bridgman, Mich. ..... 6000 hp
Hamilton, Mich. ..... 6000 hp

New York State Natural Gas Corp., Pittsburgh
3 new stations—28,900 hp
Oakford, Pa. ..... 12,500 hp
Southbend, Pa. ..... 12,000 hp
Sabinsville, Pa. ..... 4400 hp

Northern Natural Gas Co., Omaha
1 new station—8800 hp
Burdett, Kan.
Additions at:
Sunray, Texas ..... 4800 hp
Sublette, Kan. ..... 3200 hp
Mullinville, Kan. ..... 4800 hp
Bushton, Kan. ..... 11,200 hp
Clifton, Kan. ..... 9600 hp
Beatrice, Neb. ..... 4800 hp
Palmyra, Neb. ..... 6400 hp
Oakland, Iowa ..... 4800 hp
Ogden, Iowa ..... 6400 hp
Ventura, Iowa ..... 6400 hp

Texas Illinois Natural Gas Pipeline Co., Chicago
5 new stations—50,000 hp
Two in Texas, two in Arkansas, one in Illinois

Texas Eastern Transmission Corp., Shreveport
13 new stations—98,900 hp

Texas Gas Transmission Corp., Owensboro, Ky.
1 new station—3960 hp
Additions at:
Bastrop, La. ..... 3520 hp
Slaughters, Ky. ..... 1320 hp
Hardinsburg, Ky. ..... 3000 hp
Jeffersontown, Ky. ..... 1500 hp
Dillsboro, Ind. ..... 5280 hp

Tennessee Gas Transmission Co., Houston
3 new stations
Albany and Cambridge, Ohio
Hamburg, N. Y.
7 stations enlarged
Total—54,500 hp

Michigan Gas Storage Co., Jackson
Additions at:
Muskegon river station ..... 4400 hp

Transcontinental Gas Pipe Line Corp., Houston
Total—45,675 hp

Trunkline Gas Co., Houston
5 new stations—32,000 hp
Longville and Epps, La.
Independence, Miss.
Joppa and Tuscola, Ill.

Montana Power Co., Butte
Add 600 hp

United Gas Corp., Shreveport
4 new stations
Needville, Texas
Verna, Miss.
Livingston and Lafayette, La.
Additions at:
Refugio, Edna, Goodrich, and Magasco, Texas
Total—63,000 hp

Atlantic Seaboard Corp., Charleston
1 new station—3520 hp
Beverley, W. Va.

United Fuel Gas Co., Charleston
1 station—2640 hp
Lanham, W. Va.

Pacific Gas & Electric Co., San Francisco
3 new stations—44,820 hp
Topock ..... 15,000 hp
Hinkley ..... 17,500 hp
Kettleman Hills ..... 12,320 hp

El Paso Natural Gas Co.
3 new stations—10,100 hp
Navajo, Ariz. ..... 5000 hp
San Juan River, N. M. ..... 4200 hp
Angel Peak, N. M. ..... 900 hp

Northwest Natural Gas Co., New York
To be installed ..... 48,600 hp

Programs on which construction has not been started and for which information was not available when the map on pp. 96-97 was compiled include the following:

GULF-MICHIGAN GAS TRANSMISSION CORP., St. Louis, wants to build a 680-mile, 30-in. line from Perryville, La., across Arkansas, Missouri and Illinois to near St. John, Ind. where it would connect with Michigan-Wisconsin facilities. A 25-mile lateral to St. Louis is planned. Three compressor stations would have a total of 30,800 hp installed. Cost is estimated at $85 million. OKLAHOMA NATURAL GAS CO., Tulsa, plans to construct 53 miles of 26-in. line from Edmond to its Depew storage area and 40 miles of 16-in. from Chickasha to near Velma at a cost of $4400. PACIFIC NORTHWEST PIPELINE CORP. wants to build 2100 miles of line from southern Texas to Seattle and Vancouver via Oklahoma, Kansas, Colorado, Wyoming, Idaho, and Oregon. Horsepower installations would total 54,000. Cost is estimated at $174 million. UTAH NATURAL GAS CO. is planning a $32 million line from the San Juan basin to Salt Lake City.

a good deal of hopeful experiment and investigation is still under way. All of the methods have this in common—they involve some type of facility which is at or near the market served. Some methods involve substitutes for natural gas; others involve storage of natural gas near the market.

Various substitutes for natural gas are in use for filling peak hourly and daily demands. Most of these are manufactured from coal or oil. On a Btu basis, manufactured gas is very expensive and sometimes unsatisfactory for other reasons, and the trend is to get away from it whenever possible.

The Economic Storage Pattern

It is storage of gas near the market centers that presents the most interesting possibilities. There are a number of storage methods in use, and under experiment. Several merit some discussion. Storage facilities for gas are very expensive for a number of reasons; on a volume basis, gas is a very low priced commodity, as compared to the cost of constructing and operating facilities for storing it. Once constructed, the facility cannot be easily used to store anything else; it is a single-purpose warehouse. Furthermore, a storage facility must not only be able to house a large volume of gas; it must have the ability to take the gas at relatively high rates, and to deliver it at even higher rates. From a technological standpoint, there is no perfect type of storage facility. Rather, it is more realistic to think of a workable and economical storage *pattern* or plan that fits the needs and peculiarities of a particular market. Accordingly, we need to mention briefly some of the various types of aboveground storage facilities before discussing underground storage.

Storage Costs—Aboveground

Costs of various kinds of tank holders for aboveground storage have been discussed very thoroughly by Hough, Mosteller, and Randall of Southern Counties Gas Co. of California, in a paper presented at the 1949 meeting of the Natural Gas Department of the American Gas Assn.* Water-seal type holders, with capacity of 10,000 Mcf require a capital cost of $200 or more per Mcf of capacity, with annual costs around $30 per Mcf of daily capacity. High pressure tank type holders with 10,000 Mcf capacity have installed costs on the order of $300 per Mcf of capacity, and annual costs in the $40 range per Mcf of daily capacity. Capital costs of bottle holders are much lower—from $50 to $100 per Mcf of capacity, with annual costs around $10 per Mcf of daily capacity.

Natural gas may also be stored in liquid form in insulated steel tanks. A 1950 estimate of capital costs for such a facility was around $35 per Mcf of storage capacity. A suggested modification of this type is to store gas as a hydrate rather than a liquid. The advantage is that the hydrate would not require as low a storage temperature as would the liquid. The disadvantage is that the solid would require more storage space than the liquid. Both forms are discussed in an article in "Gas Age" for May 2, 1946, by Benjamin Miller.

Another type of storage now coming on the market is described in *GAS* for May, 1950, in an article by C. V. Spangler. The principle is to store liquid methane in a granular substance with high absorbent qualities. When fully charged, or wet, 1 cu ft of the material will hold some 300 cu ft of methane, none of which will flow if the soaked grains are spilled. This is a relatively safe method of storage. To get the methane out of the storage material, a current of warmer gas is circulated through it. Preliminary cost estimates show capital costs above $20 per Mcf of installed storage capacity.

Pipe holders, fabricated from commercial gas line pipe laid parallel and interconnected, are usually installed underground, but since their function is so similar to that of aboveground storage, they do not properly belong in the underground storage classification. A recent estimate of costs on the east coast indicates a capital cost of $71 per Mcf of storage capacity, and annual costs above $8 per Mcf of daily capacity. West coast studies reveal cost estimates of similar proportions.

"Line Pack" Storage

A successful variation of the high pressure underground storage is the "line pack" method used jointly by Southern Counties Gas Co. of California and Southern California Gas Co., both of Los Angeles. There the method was to build the storage into the main trunk line between Blythe and Santa Fe Springs, near Los Angeles, by using larger pipe with walls thicker than usual, and installing extra compressor capacity in order to "pack" the line with gas at the intake end. This permits gas to be taken out of the line through terminal stations at rates above or below the intake rate. As originally designed, gas is delivered to the southern California companies at the Colorado river at an approximately constant rate of 305 MMcf per day. By using larger diameter thicker walled pipe and compression up to 807 psig at the intake end, it is possible to vary deliveries at

Playa del Rey, some 20 miles from Los Angeles, is one of three storage fields operated by Southern California Gas Co. Atlhough its reservoir capacity is only about 1.5 billion cu ft, it can produce large quantities in short periods.

*Presented in abridged form in *GAS*, November 1949, p. 39.

Los Angeles from one hour to the next. The rate of delivery could be reduced to a low of 100 MMcf per day, or raised to a high in excess of 500 MMcf per day. Thus the difference between the intake rate and the minimum delivery rate may be stored at night in the 200 miles of line, for use next day. Total withdrawals for the 24-hr period were of course about equal to the input of 305 MMcf. The original capacity has been increased.

It is estimated that the storage capacity built into the line was about 52 MMcf of gas, though under favorable operating conditions it might be as high as 70 MMcf. The capital costs were $37 per Mcf when the line was built in 1947-1948. On a basis of 52 MMcf storage capacity, annual costs were computed at $7.24 per Mcf of daily capacity.

Not the Solution

Two things are apparent from this discussion of various kinds of storage facilities: (1) Such storage is very expensive, when one considers that the product sells to the ultimate consumer at prices in the range of 30 to 70 cents per Mcf. (2) Partly as a consequence of high storage costs, and partly for technological reasons, the possibilities of these types of storage are very limited. At best, they can serve to take care of hourly or daily peaks, and in some cases they are useful for emergency needs. But given present or foreseeable consumer prices for gas, these methods are not the solution for the problem of seasonal peaks extending over the winter months. That function is performed best by natural or prepared underground reservoirs.

The Answer is Underground

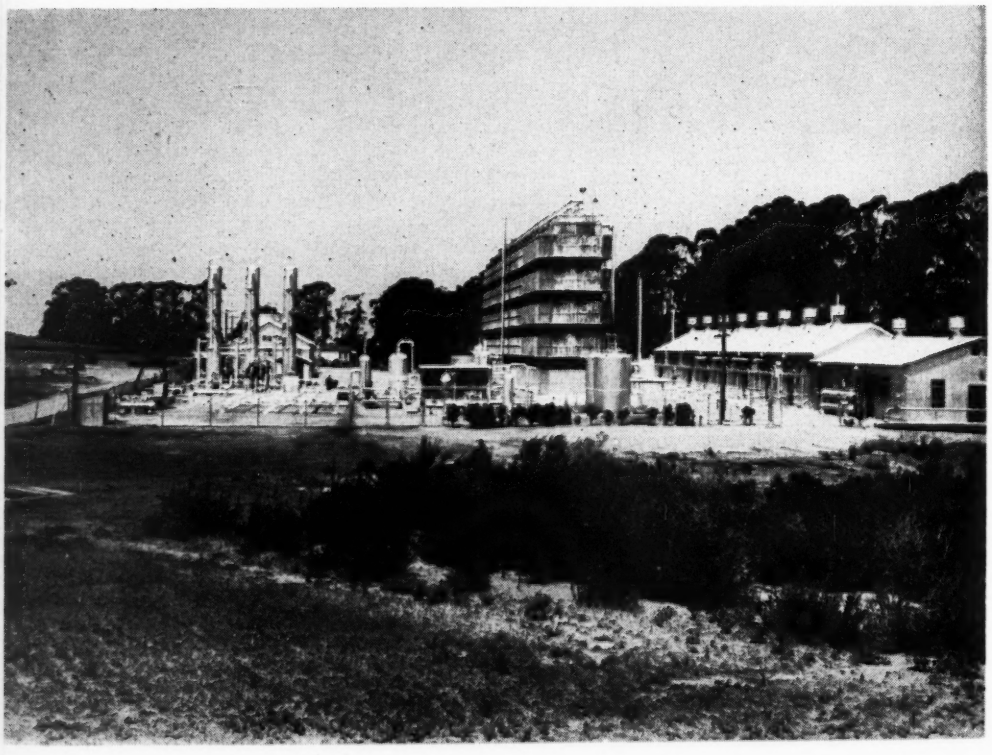
Gas storage to meet short-lived peak loads and emergencies has long been a commonplace in the gas utility industry. The manufactured gas industry has used aboveground steel holders for these purposes for many years. But recently, and particularly in the past decade, there has been considerable interest and activity in storing natural gas in depleted or partially depleted gas or oil fields. Gas stored in this manner can meet not only the short peaks, but in addition it can be stored in sufficient quantities to take care of the winter season, and generally at reasonable cost.

In order to meet the heavy demands of the winter season, a natural reservoir must be able to hold a large quantity of gas. In order to meet the extremely heavy requirements made on a utility during certain peak days and hours, a good reservoir should be able to deliver gas immediately upon call, and at high hourly rates. In addition, in order to have the gas to deliver, and at desirable pressures, a storage facility must be able to take gas into storage rather quickly.

It is very often true that a reservoir which can hold a large quantity of gas cannot deliver it quickly; and contrariwise, one which can deliver gas in large volumes to meet short peak demands would be unable to maintain such delivery rates for very long, because its capacity is small. Hence it is customary to distinguish between the two types, though of course the line of distinction is not clearly drawn. The Playa Del Rey reservoir near Los Angeles and the Osage reservoir near Tulsa are examples of fields with relatively small storage capacity, but with a very great capacity to produce. The Haskell field in Oklahoma is of the other type—rather large storage capacity as compared to delivery capacity. And La Goleta, in California, is that fortunate and unusual occurrence—a field which possesses both characteristics; it holds a lot of gas, and delivers at high daily or hourly rates.

Good storage fields have other characteristics besides capacity and deliverability. Location is very important; the reservoir should be near the market it serves, and because of transport costs, it should be near the transmission line or other immediate supply source on which the storage field draws. The reservoir should be reasonably free from leakage, so that losses of stored gas are not too great. In a few instances storage operations have been discontinued after a trial period due to excessive gas loss.* Finally, the storage operation should not require too large a quantity of cushion gas, in relation to the quantity of gas which the facility is expected to store.

La Goleta is the largest of three storage fields in the Southern California Gas Co. system. Acquired in 1939, its withdrawals were increased in 1944 from 69 MMcf per day to 210 MMcf through the construction of additional facilities on the La Goleta-Los Angeles pipeline, and have since been boosted to 365. Photo shows the compressor station.



Pressure in the Reservoir

To pump gas out of storage would be an expensive operation. In order to avoid that, it is cheaper to build up the underground pressure of the reservoir so that the reservoir itself will have the

*It is not possible to state the economic limits to leakage, except in very general terms. The stored gas, used to meet peak demands, will have a value to the operating utility dependent upon the type of peak demand that is to be met, and depending on the cost of alternatives available for meeting it. For example, gas used to meet short daily or hourly peaks in extreme weather is so important to an operator that he would be willing to incur pretty high costs in order to have it available. If he had a small storage reservoir that lost some 15% to 20% of the gas put into it, but which could produce a lot of gas quickly and on short notice, he might find it worth his while to use it in his storage operation, because it would be able to furnish him cheaper gas for short peaks than he could get by aboveground storage methods, or by manufacturing gas. On the other hand, if the available reservoir were quite large, but was a slow producer, it might not be economically feasible to operate, even though leakage were as low as 5% to 10%.

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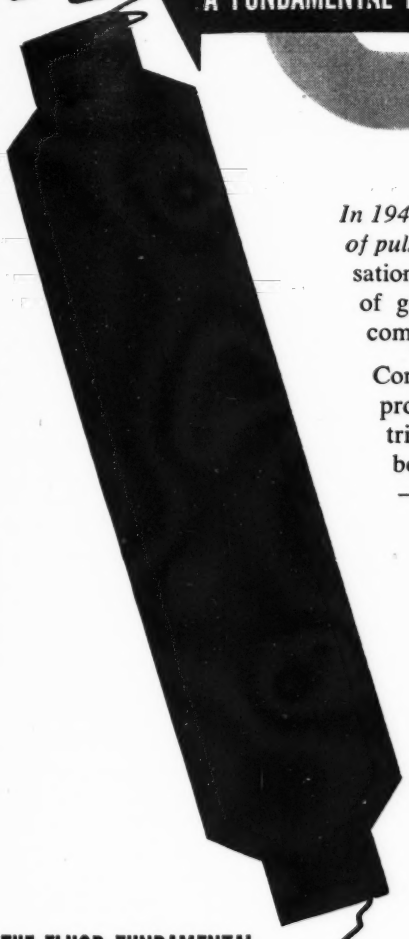

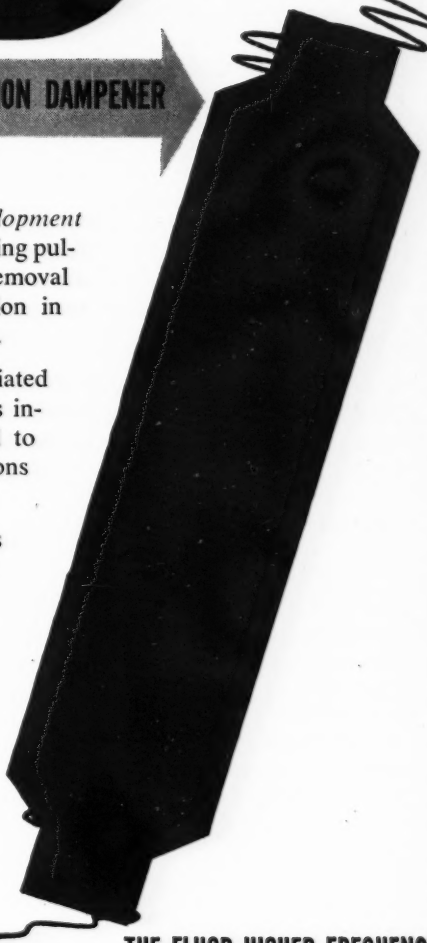

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energy to deliver the gas into the lines at the required pressure. In general, and allowing for factors for which adjustment can usually be made, a reservoir will perform in a storage operation just as it did originally. Usually, the aim is to build up the reservoir energy to equal the original rock pressure, though in some cases such as La Goleta it is feasible to exceed that limit modestly.

The Minimum Pressure Limit

As gas is withdrawn during the winter season, the underground pressure is reduced; the lower limit is the reservoir pressure below which the field will not be able to meet the peak demands made on it toward the end of the winter season. Thus the quantity of marketable gas which a reservoir can hold is the difference between the maximum, which depends upon the assumed maximum underground pressure which is desirable; and the minimum, which depends on the desired delivery rate at the end of the storage season. The gas remaining in the ground, which could be produced if it were not necessary to maintain a minimum underground pressure, acts as a permanent cushion on top of which the marketable gas is injected for storage.

Effect of Cushion on Gas Rates

This cushion gas is an integral part of the storage facility. It is truly a part of the plant, at least to the extent that it has been put in the reservoir to serve year after year as a cushion. Thus it is logically a part of the rate base, and the return on the investment in the cushion gas is a part of the storage cost to be assessed against the turnover gas. Hence an operator prefers, from an investment standpoint, a storage field where a large quantity of turnover gas can be stored on top of a relatively small cushion.

The characteristics of the ideal storage field are only approximated in reality. But there are many good storage fields being developed or in operation which are good not only because of their physical characteristics and location, but also because they fit so well into the storage pattern of the companies which operate them. Before discussing two successful storage operations, it is well to look briefly at the history of underground storage.

History of Underground Storage

The earliest successful storage operation on this continent was in Canada, in Welland county, Ontario. This was first developed in 1915. In 1916, the Zoar field near Buffalo, N. Y., began operations. In 1919, a much larger storage project was developed in the Menifee field in Kentucky. There were some important storage fields developed in the late 1920's and early 1930's, but the big development, now in progress, began after 1937. In 1939, some 8 billion cu ft of gas was stored. By 1943, there were more than 50 storage areas in operation with estimated storage capacity of 135 billion cu ft and daily deliverability of 750 MMcf. By 1949, total working storage capacity of the approximately 100 fields in use was in excess of 440 billion cu ft. Gas actually in storage on Dec. 31, 1950, was 342 billion cu ft.

It is interesting to note the geographic distribution of the gas in storage. Of course, not all states have available the necessary depleted or partially depleted oil or gas reservoirs which are, in the present state of technology, necessary for an underground storage operation. But it happens that some of the most populous areas of the nation, where the need for storage facilities is greatest, are old oil and gas producing areas, and do have the needed reservoirs.

TABLE 1. Distribution of Stored Gas By States

STATE	Gas in Storage (Billion Cubic Feet) Dec. 31, 1948	Dec. 31, 1949	Dec. 31, 1950
California	12.0	15.0	19.2
Kentucky	10.0	12.5	11.6
Michigan	15.6	21.7	32.3
New York	7.1	9.7	10.8
Ohio	48.3	66.9	73.8
Pennsylvania	41.0	58.0	57.9
West Virginia	25.0	42.6	56.2
Kansas	27.0	29.0	29.3
New Mexico	3.8	11.2	18.1
Oklahoma	12.6	16.1	24.4
Other States	3.4	5.7	8.1
Total—United States	205.8	288.4	341.7

Source: AGA-API Annual Reserve Reports.

TABLE 2. Gas Stored and Taken From Storage—1945-1949
(Billion Cubic Feet)

Year	Gas Stored	Gas from Storage
1945	70	46.5
1946	76	61.5
1947	93	86.
1948	138	84
1949	187	98

Source: *Gas Facts*, 1949. Figures for gas utilities only.

States of Declining Production

The first seven states listed in *Table 1* are states of declining production. They are long distances from the gas fields which furnish them much of their gas. In those cases, it is chiefly the load factor on the long transmission lines which makes storage so desirable. In the case of the last three states mentioned, while the load factor is important, an equally important factor stems from the conditions of purchasing residue plant gas. Gas which comes to pipeline operators in the form of residue gas from gasoline plants is sold ordinarily on a 100% purchase, take or pay basis. Hence the need for underground storage, to give flexibility to supply, even though no great amount of transportation may be involved in getting the gas to final markets from points of production. In some operations, such as Bow Island field, Alberta, or certain operations of Oklahoma Natural Gas Co. and El Paso Natural Gas Co., gas which otherwise would be flared is injected into underground reservoirs.

Growth of Reservoir Storage

A further indication of the growth in underground storage is apparent from a consideration of the gas stored, and taken from storage, each year by gas utilities. The figures are available for five years. See *Table 2*.

Not only are the utilities storing more and more gas underground, but it is noteworthy that at this time annual withdrawals are substantially less, and are increasing at a slower rate, than are annual inputs. When the storage program becomes essentially complete the annual input and output will be in approximate balance for a normal year.

The continued growth of reservoir storage is indicated by the frequent

news items in oil and gas journals announcing new storage projects by various companies. A random check of seven such articles reveals an estimated investment in storage capacity of more than $100 million to be made in the next few years. Some of these projects are small, and will add more to the ability to handle short peaks than to the seasonal deliverability of the systems served. But there are some large projects which will increase substantially the seasonal gas available to some markets. An example is the Oakford field, near Pittsburgh, which is being developed jointly by New York State Natural Gas Co. and Texas Eastern Transmission Co. Oakford will be able to hold 60 billion cu ft of turnover gas by 1955, with delivery rates up to 400 MMcf per day. Oklahoma Natural Gas Co. is developing a new facility with capacity of 50 billion cu ft, which is just four times the size of the combined facilities in use previously. These two facilities represent an increase of about 25% in the national storage capacity.

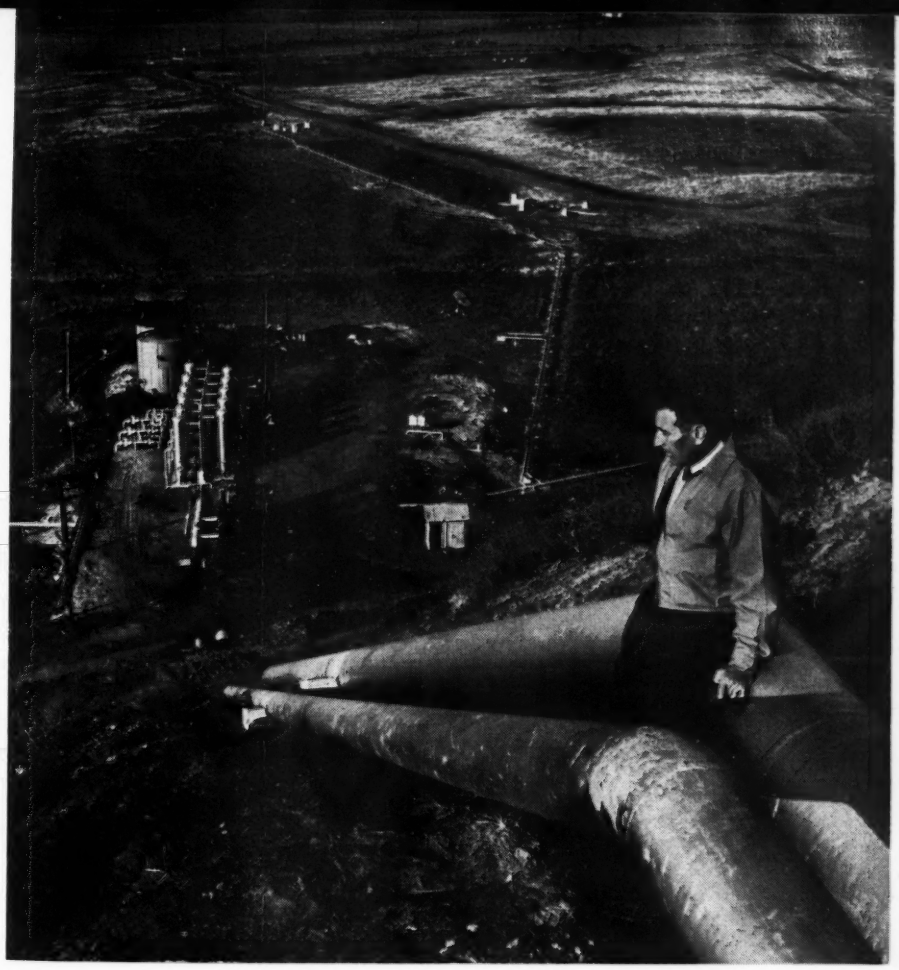
Underground Storage Experiments

Further indications of the growing importance of underground storage are seen in certain experiments now in progress. Several companies are testing the use of water filled sands with good structural features as underground gas storage reservoirs. Investigation and experimental development are in progress leading to the creation of underground caverns to be used as natural gas reservoirs. All of these developments point to continued growth in underground storage for some time to come.

The Columbia Gas System, an integrated system which produces, transports, and sells gas at wholesale and retail in the Appalachian region, now operates some 43 separate storage units or pools with ultimate capacity of about 189 billion cu ft. Total gas in storage including native gas, at the beginning of the 1950 winter season was about 129 billion cu ft, with daily deliverability of an estimated 800 MMcf and total gas available for delivery of about 34 billion cu ft. The maximum day delivery for the system during the 1950-51 season was 2.230 billion cu ft, with 737 MMcf of that coming from storage. But it is estimated that for 1950 only 8% of annual requirements was from storage. The gas taken from storage by Columbia on Jan. 8, 1951, was greater than the carrying capacity of a 30-in. high pressure line.

TABLE 3. Columbia System Sendout

Nov. 19, 1949	More than 600 MMcf. Some gas was stored that day.
Dec. 14. 1949	More than 1500 MMcf. About a third of that was from storage.
Jan. 24, 1950	About 900 MMcf. Some gas was stored that day.
March 2, 1950	About 1800 MMcf. About 500 MMcf was from storage. In addition, the company had to use some high-cost LP-Gas.



Playa del Rey lacks many of the qualities which are considered desirable in a storage field. Operation is hindered by liquid problems in the reservoir, by migration of gas—to some extent, and by continued oil and gas production from flank wells. Nevertheless, in the overall storage operation of utilities in the area, it plays an important part because of location, high hourly delivery.

A 3-Field Storage System

Certain data for the 1949-1950 winter season indicate the importance of underground storage to the Columbia system: See *Table 3*.

It has already been noted that the La Goleta field, in California, is practically ideal, because of location, capacity, and ability to deliver gas. Three gas companies in the Los Angeles area operate, for mutual benefit, three gas storage fields: La Goleta, which is by far the largest, Buena Vista Hills, and Playa del Rey. Together with the Blythe-Santa Fe Springs line pack, these three fields combine to form a reasonably good storage operation for the utilities concerned.

Initial storage in Buena Vista Hills began in 1928. The maximum capacity of the reservoir is only about 2.5 billion cu ft, or about as much gas as La Goleta can deliver in nine or ten days. Because of the small capacity, and because it was discovered that gas was draining to adjacent areas, the storage operation ceased. By 1950, conditions had changed so much and remedial measures were so successful that storage was again begun. The advantage of this small reservoir in the overall storage operation is its location; it can deliver some gas quickly to assist in meeting daily and hourly peaks.

Production vs. Pipeline Capacity

Playa del Rey is a part of the storage system for the same reason. It is about 20 miles from Los Angeles, and although its reservoir capacity is only about 1.5 billion cu ft, it can produce large quantities in short time periods. Playa del Rey lacks many of the qualities which we have set forth as desirable in a storage field; the operation is hindered by liquid problems in the reservoir, by migration of gas to some extent, and by continued gas and oil production from flank wells. Nevertheless, in the overall storage operation of the utilities in the area, this pool plays an im-

portant part because of its location and high hourly deliverability.

La Goleta was acquired by Pacific Lighting Corp. of Los Angeles in 1939-1941, and in the latter year the owner began injecting gas into the reservoir. The field, which had been discovered in 1929, had produced some 15.3 billion cu ft by that time. As the demand for gas increased in southern California markets, and as production declined and more and more local gas was withdrawn from market for repressuring operations, the need for the La Goleta storage capacity became more apparent. In 1944, construction began to increase the delivery capacity of the La Goleta-Los Angeles pipeline system from 69 MMcf a day to 210 MMcf per day. Also in 1944, Pacific Lighting completed two new wells which are believed to be the largest dry gas wells ever brought in in California: on production test, one flowed at 145 MMcf per day, the other at 128 MMcf. With these two wells, the field's ability to produce exceeded the pipeline capacity to deliver.

La Goleta: A Success Story

In the past decade the bottom-hole pressure has been built up to exceed the original of 1905 psig. At the beginning of 1950, withdrawal rates of 275 MMcf per day were possible, though the reservoir has never delivered that much gas in a 24-hr period because the Los Angeles market has not required it.

The operation of La Goleta has been so successful that additional wells will be drilled and the line to Los Angeles will be looped in order to take care of anticipated growth in peak demand. By next winter, facilities will be completed so that the storage pool will be able to deliver more than 365 MMcf per day at a line pressure of 1000 psig. Normal seasonal capacity of the reservoir is considered to be about 10 billion cu ft, although I believe that much greater annual turnover would not damage the reservoir. It should be emphasized that La Goleta's location and its ability to deliver a large quantity of gas on short notice make it highly useful in handling daily peaks as well as for taking care of the seasonal peak. La Goleta, together with the two smaller fields and the line pack storage facility, in combination form an enviable storage operation which many another marketing area would be glad to have.

Relative Cost per Mcf

In the discussion about other types of storage earlier in this paper, it was seen that the capital cost amounted to many dollars per Mcf of storage capacity. By comparison, underground storage costs are small.

In 1949, Max W. Ball collected some definitive cost data from 26 companies that have important underground storage operations. He reported his findings at the spring meeting of the American Gas Assn. in 1949. Investment cost data were presented on 14 fields, in six states. Investment cost includes costs of acquiring the field and its contained gas, and costs of preparing the field for storage and delivery operations, including the cost of the cushion gas. Costs varied from 2 cents per Mcf of storage capacity in a field in Kansas, to 53 cents per Mcf in a field in Kentucky. Such figures are a far cry from the investment cost estimates discussed for aboveground types of storage.

Cost Range: 5 to 20 Cents

There are not many storage fields where capital costs per Mcf of capacity are as low as 2 cents. And only under unusual conditions, and to store small quantities of gas for highly essential peaks, would it be worth while for a company to invest in a storage facility which cost the company on the order of 50 cents per Mcf of storage capacity. It is probably better to think of a range of from 5 cents to 20 cents per Mcf of storage capacity as being representative of the costs of underground storage.

The Natural Reservoir

Generally speaking, underground storage is storage in large quantities, with the attendant investment in well drilling and maintenance, cushion gas, pipelines, and gas injection facilities. Even at 5 cents per Mcf, the dollar investment is very great for a facility of any size; at costs above 20 cents, it would probably be prohibitive in most cases.

The cost of gas storage in underground reservoirs, including in-and-out operating costs, amortization of facilities, interest, and utility earnings, ranges from less than 5 cents to as much or more than 15 cents per Mcf.

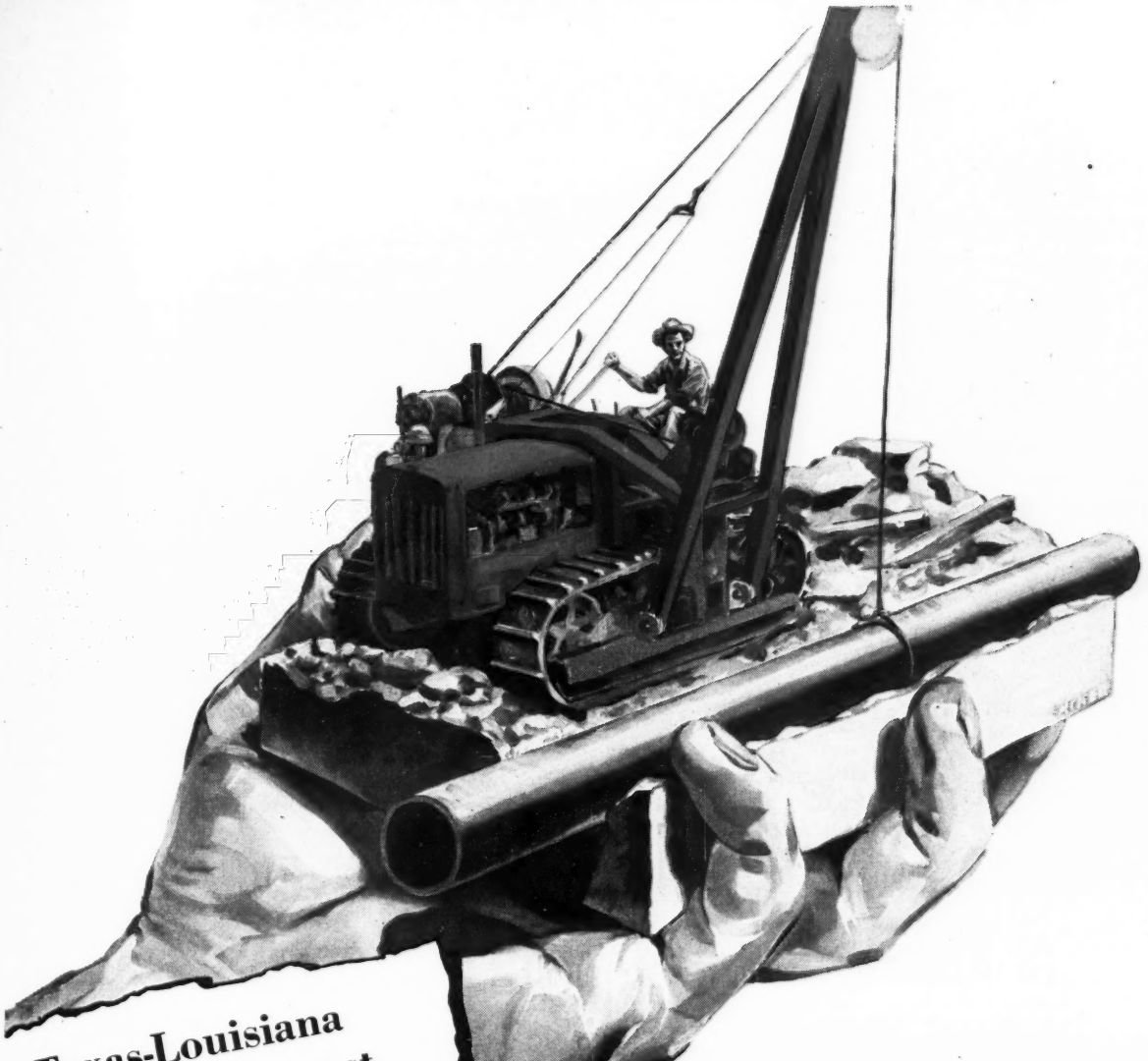
There is no close substitute for underground storage of natural gas in natural reservoirs. There are alternatives, but they are so inferior that operators are trying to get away from them. These alternatives include interruptible sales, still widely practiced, or low load factor operation which means high cost gas. Aboveground storage in volume has been seen to be too costly to be a good substitute. Fortunately, depleted or near depleted gas or oil wells are available for storage purposes at a large number of the nation's points of heavy natural gas consumption. If present efforts and experiments are successful, the decade of the 1950's may see the other big markets served by some adaptation of the natural reservoir principle.

Conservation for Domestic Sales

Underground storage is increasingly important as the demand for gas continues to grow faster than the supply increases, and as the load factor problem becomes more acute. Under pressure of rising gas costs, transmission line companies and utilities are becoming more interested in conservation in the economic sense. That is, they want to get away from low-priced industrial sales for interruptible uses—or at least they certainly do not want to increase such sales—so they are trying to store gas. In many cases the transmission companies may not actually store gas, but they are making contracts to sell gas, at relatively low prices, to utilities who have or are developing storage facilities near the markets. The price is low because the seller does not have to sell unless he has some excess gas, usually in the summer; and the buyer does not have to buy unless he has some storage capacity available. And the price is low enough to make increased storage operations attractive to utilities. The underground storage facility is an agency of economic conservation.

Store More; Sell Less

And so it is that, in the overall national problem of conserving our natural gas resources for the most desirable uses, underground storage plays a large part that will become more important in the future, as the domestic space heating market expands. This is a good thing for the nation. If we hope to extend over time the domestic use of natural gas, it is necessary to store more gas in prepared underground facilities, and to sell less in the interruptible industrial markets.



Texas-Louisiana Sponsors Largest Pipe Line Contract

The contract now in progress for construction of 1,017 miles of pipe line for United Gas Pipe Line Co. is believed to be the largest single contract ever awarded for pipe line construction. The contract was sponsored by Texas-Louisiana Contractors, and is being undertaken by Gulf Southern Contractors, a joint venture in which Texas-Louisiana has a major share of the responsibility.

The new construction will increase the daily capacity of the United Gas system by more than one-third, and is estimated to cost $111,000,000. Large diameter pipe will reach 28 miles out into the Gulf of Mexico and far down into South Texas to provide additional supplies of gas for United's increasing market.

Trust your Job to Seasoned Hands

You can depend on Texas-Louisiana Contractors to push a job through, because your job is in the hands of men seasoned by many years of pipe line experience on big jobs and little jobs alike from coast to coast and border to border. Call on Texas-Louisiana for NEW CONSTRUCTION, MARINE CROSSINGS, TAKING UP AND RECONDITIONING OLD LINES.

TEXAS-LOUISIANA
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Fort Worth 1, Texas

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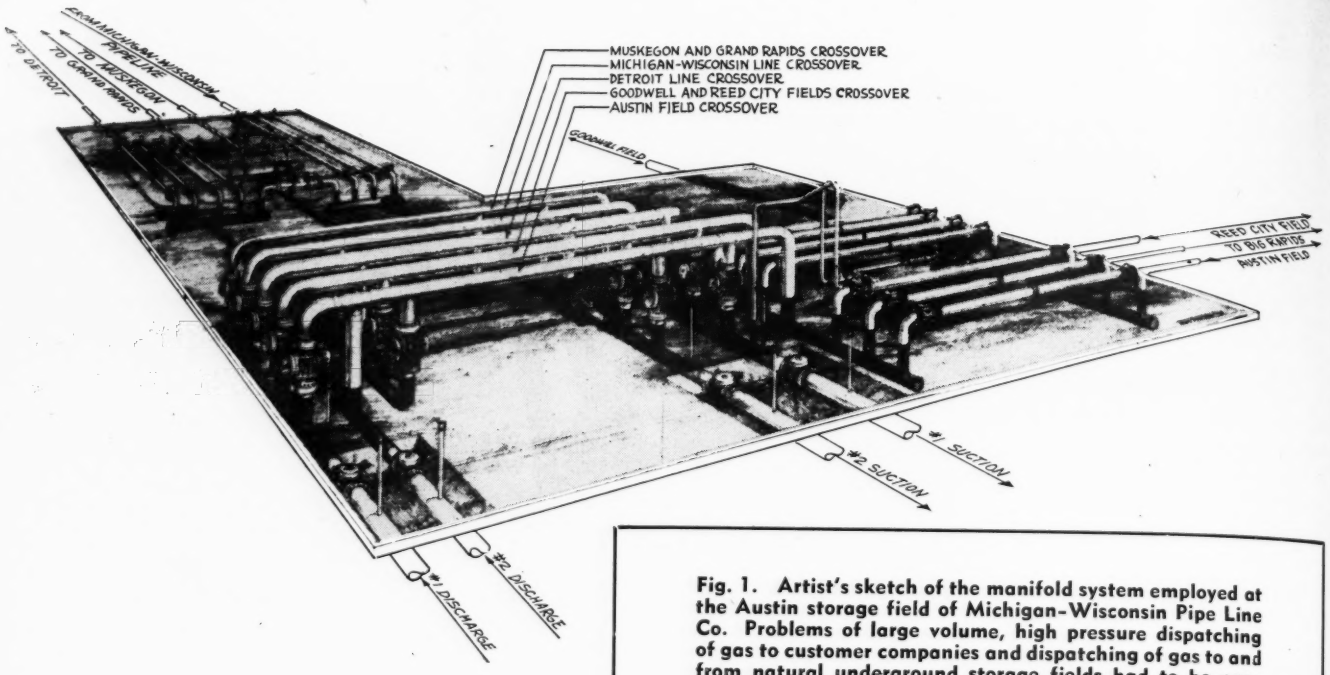


Fig. 1. Artist's sketch of the manifold system employed at the Austin storage field of Michigan-Wisconsin Pipe Line Co. Problems of large volume, high pressure dispatching of gas to customer companies and dispatching of gas to and from natural underground storage fields had to be considered in its design.

FLEXIBLE TWO-WAY FLOW ACHIEVED IN AUSTIN FIELD MANIFOLD SYSTEM

By CHARLES R. HETHERINGTON
Ford, Bacon & Davis Inc.

THE design layout of natural gas transmission systems usually requires some kind of a manifold system where volumes of gas are transferred in and out of storage, where gas must be dispatched to several connecting systems and where any other controlled dispatching to several pipelines is required. Where large volumes are handled at high pressure the component piping, valves, and meters are individually costly and, accordingly, careful design of manifold facilities is required for minimum cost with elimination of any duplication of possible valving operations.

Exclusive

The selection of a suitable installation for handling gas at the terminal of the Michigan-Wisconsin Pipe Line system in the Austin storage area of Michigan posed all of these problems of large volume, high pressure, dispatching of gas to customer companies, and dispatching of gas to and from individual natural underground storage fields. The master gas-dispatching manifold, designed and constructed by Ford, Bacon & Davis Inc. for this service, and its operation with the integrated facilities of Michigan-Wisconsin Pipe Line Co. is described in the following paragraphs.

Michigan-Wisconsin Pipe Line Co. delivers gas from the Panhandle area of Texas principally to communities in Wisconsin and Michigan, with certain lesser deliveries to communities in Iowa and Missouri. The present design capacity certificated by the Federal Power Commission is 303,000 Mcf per average day. The mainline transmission system is equipped with spare compressor engines in order that this average delivery capacity can be maintained throughout the year.

During the summer-time or off-peak period, the pipeline delivers Texas gas to the communities in Missouri, Iowa, Wisconsin, and lake front cities in western Michigan, and any remaining gas is delivered to the terminal of the transmission system in the Austin storage area in Mecosta county near Big Rapids, Mich. There, the gas is dispatched into pipelines for cities served by Michigan Consolidated Gas Co., and the remaining gas is dispatched to storage in natural underground reservoirs. All of the gas for distribution from this central location is sales metered, while the gas for storage is check metered for accounting purposes.

During cold weather or the peak period, when Missouri, Iowa, Wisconsin, and Michigan markets need more gas than is available from mainline capacity, these additional requirements are withdrawn from storage. Under cold weather conditions gas is fed from storage to the cities of Michigan and back through the pipeline from Texas to supplement supplies to the Wisconsin cities.

A compressor station of 17,780 hp is provided at the Austin storage area to pump gas into storage when line pressures are low and to pump gas out of

storage when high delivery line pressures are required. Each compressor in the station is valved so that it may pump from either of two suction lines into either of two discharge lines; that is, the station is of the double-suction, double-discharge type.

Fig. 1 is an artists's sketch of the manifold as designed, *Fig. 2* is a construction photograph, and *Fig. 3* is a picture of the completed installation.

Basically, the manifold consists of pipelines intersecting at right angles at different elevations connected by vertically valved risers. North-south pipelines can be connected to the east-west pipelines by opening the valves in the risers. Metering equipment is provided in the north-south and east-west pipelines.

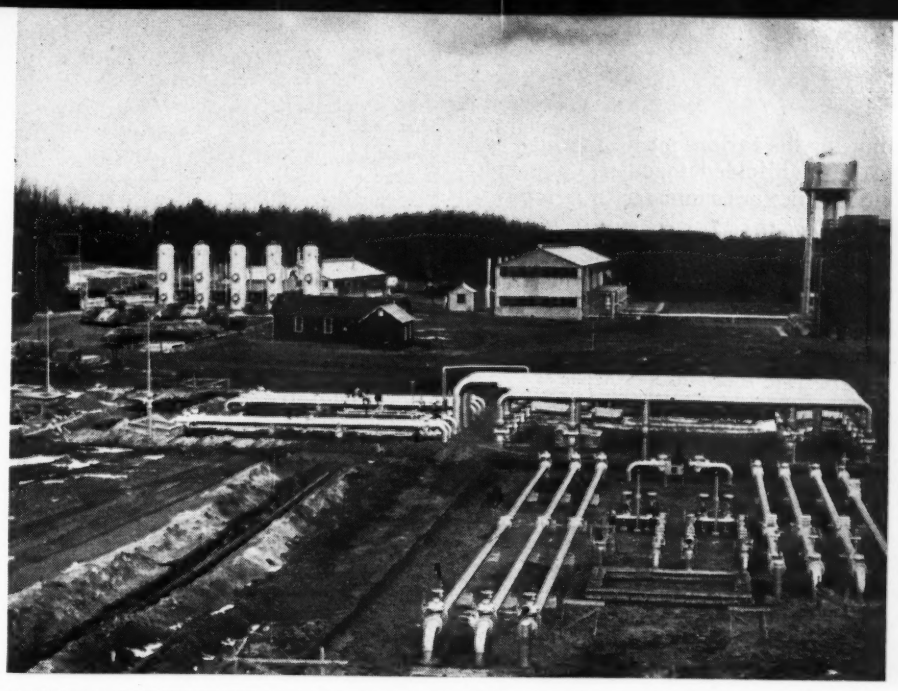
The double-suction and double-discharge lines from the compressor station are shown in the foreground of *Fig. 1.* To the right are the meter tubes and connecting pipelines for the storage fields and to the left rear are the meter tubes to Michigan cities and to the Michigan-Wisconsin pipeline from Texas.

Meter Installation

To the right of the drawing, the first three meter tubes are for the Austin storage field. This metering installation is designed to permit measurement of flow in either direction. Inasmuch as flow reversals may be required at any time, perhaps several times a day, the metering installation is designed for rapid changeover for reverse flow. Similarly, the meter installation to the Michigan-Wisconsin line is designed for ready changeover to reverse flow.

Typical operation of the manifold can be visualized by noting the possibilities for pumping into or out of Austin field. The first crossover in *Fig. 1* is for the Austin field and permits connecting the Austin field meter installation and pipeline with any of the four suction or discharge lines, with the pipeline to Detroit, or with the Michigan-Wisconsin pipeline from Texas. Gas can be flowed into or out of Austin field from the Detroit line, from the Michigan-Wisconsin line, or from any other line connected into the compressor station suction or discharge lines, or gas can be pumped into or out of Austin field through the compressor station. Austin field may be valved to either suction or either discharge of the compressor station for operation at pressures different from other parts of the manifold.

Similar flexibility is provided for valving of other crossover lines, although valves have been left out of the risers where operational requirements do not indicate the need for a valve.



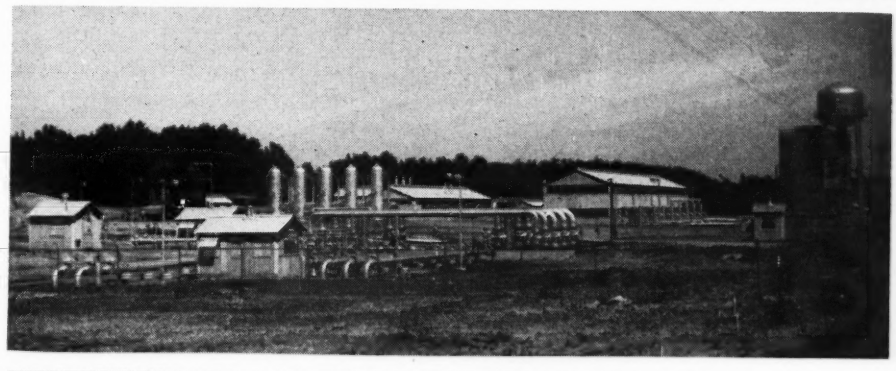


Fig. 2 (top). Construction photograph of Austin manifold.

Fig. 3 (center). Completed master gas dispatching manifold.

Fig. 4 (bottom). Construction photograph indicating size of pipe.

To the left center of *Fig. 1* there is shown a regulator connecting the Michigan-Wisconsin line with the line to Detroit. (Shown also in the right center of *Fig. 2.*) This is a transfer regulator which permits flowing gas directly from the Michigan-Wisconsin line to the system of Michigan Consolidated without sending the gas through the manifold.

The piping in this manifold is designed for operation at 1000 psi in accordance with Division 1 of the American Standards Assn. Code for Pressure Piping, and Nordstrom ASA 600 series plug valves are used throughout. A better idea of the size of the installation is given by a comparison with the workmen in the construction photograph, *Fig. 4.*

Fig. 5 gives a schematic diagram

showing the various pipelines which had to be manifolded together. The individual lines are summarized as follows:

Storage Field Lines
Austin field
Goodwell field
Reed City field
Lincoln-Freeman field

Cities
Detroit, Mt. Pleasant, Ann Arbor
Grand Rapids, Greenville, Belding
Muskegon
Big Rapids

Supply Line
Michigan-Wisconsin Pipe Line Co.

Compressor Station Lines
Suction No. 1
Suction No. 2
Discharge No. 1
Discharge No. 2

To handle this multiplicity of lines with an even greater multiplicity of valving requirements, the intersecting or meshed manifold arrangement was indicated to be the only suitable arrangement for minimum cost.

Interconnections

Before the double-suction, double-discharge feature of the compressor station and the final manifold arrangement were decided upon, the requirements for interconnecting the various lines and the prevailing pressures of the lines were analyzed. Storage fields to be connected have the general characteristics listed in *Table 1*.

TABLE 1. STORAGE FIELD CHARACTERISTICS

Storage Field	Pressure Range Psig	Storage Capacity Billion Cu Ft	Nominal Peak Load Capacity MMcf per Day
Austin	402 to 600	5.7	220
Goodwell	300 to 600	10.5	120
Reed City	307 to 600	11.8	120
Lincoln-Freeman	400 to 650	11.3	120

As noted in *Table 1*, Austin field has a relatively small storage volume but high output capacity and, accordingly, serves as a peak load storage field. Goodwell and Reed City fields are large-volume, lower productivity fields and, accordingly, are better suited for base load.

In actual operation, gas is pumped at a relatively uniform rate from Goodwell and Reed City and when all of this gas is not required for market during the winter-time, the excess is pumped into Austin field to maintain it at high pressure for peak load purposes. Thus, the need for a double-discharge station is seen in order that gas may be pumped to market at one pressure and into Austin field at another pressure.

Austin and Lincoln-Freeman fields operate through nearly the same range but Goodwell and Reed City operate through wider ranges; thus the need for a double-suction station is seen.

Load Estimates

The 1952 load conditions estimated before the Federal Power Commission for cities receiving gas from Michigan Consolidated from this manifold are summarized as follows:

City	1952 Max. Day MMcf
Detroit	599.0
Ann Arbor	16.5
Mt. Pleasant	6.8
Greenville-Belding	3.6
Grand Rapids	75.6
Muskegon	28.5

Different pressures are required in the various lines to deliver these various quantities of gas. Some of the lines can be flowed from storage or from the Michigan-Wisconsin supply, while others must be pumped. Every operating condition that could be visualized for handling five-year estimated loads was drawn on flow sheets and the manifold was laid out with valving to permit handling any and all of these many operations.

The manifold was constructed accordingly and has now been in successful operation during two winters. Each year certain additions have been made and this summer will see the addition of facilities to valve in the Lincoln-Freeman field and the second 1000-lb, 24-in. line to Detroit.

This technique of meshed pipe manifolds has proved so successful in providing flexibility at minimum cost that it is being employed in other installations presently being engineered by Ford, Bacon & Davis Inc.

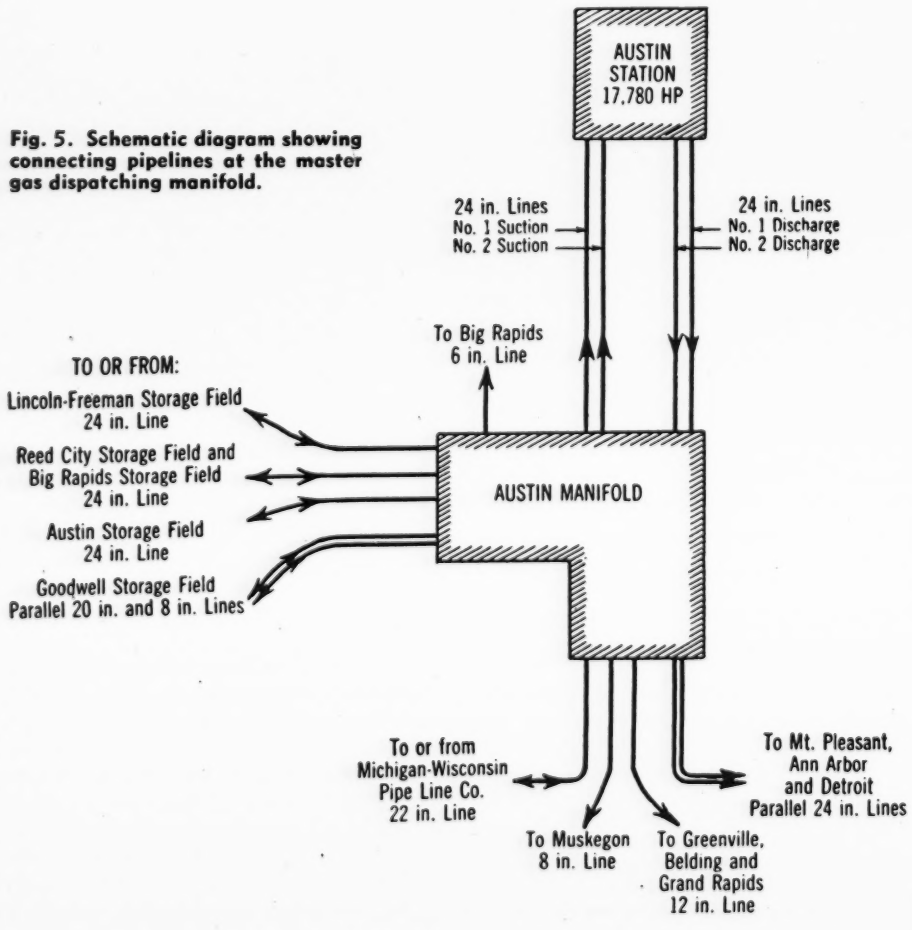

AUSTIN STATION 17,780 HP
24 in. Lines
No. 1 Suction
No. 2 Suction
24 in. Lines
No. 1 Discharge
No. 2 Discharge
To Big Rapids 6 in. Line
TO OR FROM:
Lincoln-Freeman Storage Field 24 in. Line
Reed City Storage Field and Big Rapids Storage Field 24 in. Line
Austin Storage Field 24 in. Line
Goodwell Storage Field Parallel 20 in. and 8 in. Lines
AUSTIN MANIFOLD
To or from Michigan-Wisconsin Pipe Line Co. 22 in. Line
To Mt. Pleasant, Ann Arbor and Detroit Parallel 24 in. Lines
To Muskegon 8 in. Line
To Greenville, Belding and Grand Rapids 12 in. Line

Fig. 5. Schematic diagram showing connecting pipelines at the master gas dispatching manifold.

ACKNOWLEDGMENT

It is desired to acknowledge the cooperation of Michigan-Wisconsin Pipe Line Co. and Michigan Consolidated Gas Co. for their assistance in the preparation of this article.

Tell us—

INTAKE PRESSURES AVAILABLE...

DISCHARGE PRESSURES REQUIRED...

STATION CAPACITY:

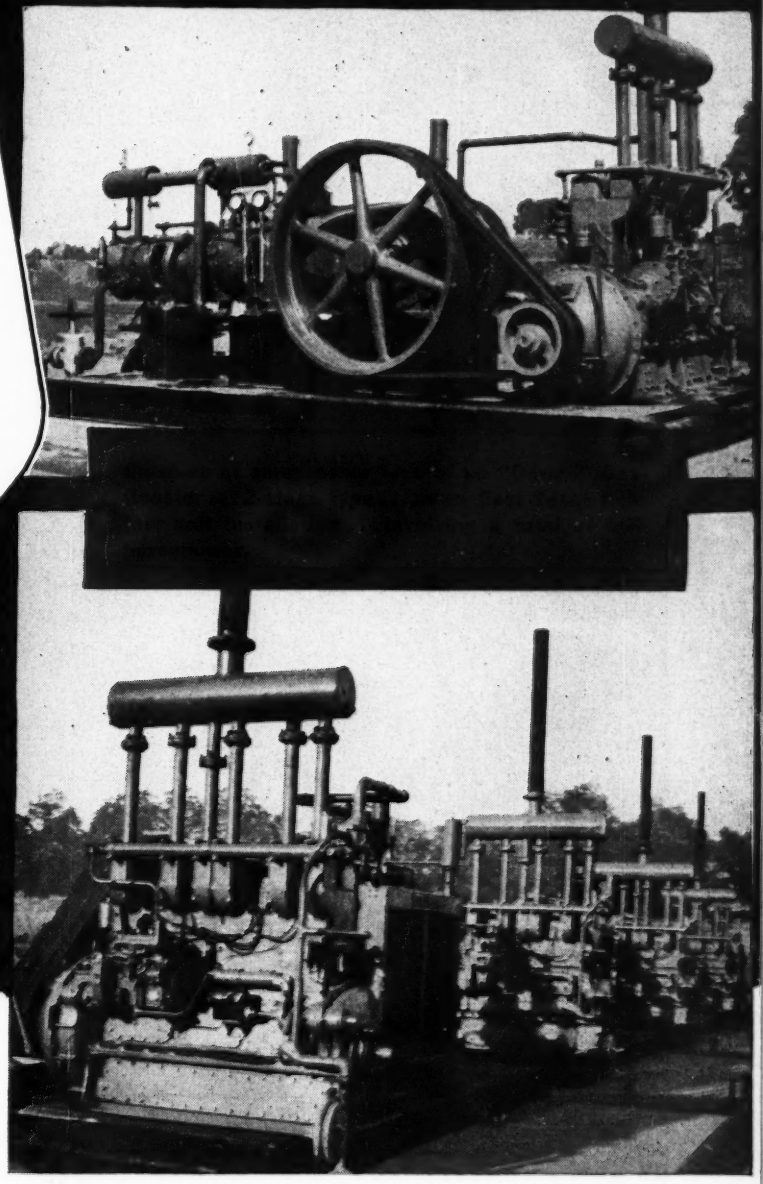
Cu. ft. per 24 hours

TYPE OF APPLICATION:

Gas Transmission.....

Underground Storage....

Other.....



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BETTER BUILDERS

Spray gun in operation on first spraying with Ammate solution.

CONTROL OF BRUSH ON MARSH LAND RIGHTS OF WAY

By E. C. GRECO
United Gas Corp., Shreveport

Exclusive

UNITED Gas Pipe Line Co., Shreveport, owns and maintains several hundred acres of rights of way which cross marsh lands or parallel canals in southern Louisiana. The extremely rapid growth of plants has made the maintenance of telephone lines along these rights of way by hand-cutting methods a tremendous task. Frequent topping of tall plants has been necessary to protect the telephone lines. The resistance offered to the movement of personnel by heavy blackberry and brush growth, abundant hornet and bumble bee nests, and numerous reptiles which inhabit the area make the work of hand cutting difficult. When telephone line failure occurs, a large amount of time is spent in blazing a trail to the suspected point of trouble. Sometimes several hours of trail blazing are necessary before the point of breakdown is located, although only 30 minutes may be required to make the repair.

For the past several years the willow trees and brush growth, consisting of waxmyrtle and marsh elder, have been kept from interfering with the telephone lines by topping them with brush hooks. This cutting has been practiced directly under the lines. The operation is tedious, hazardous to personnel, slow, expensive, and offers temporary control at best. Where one limb is cut, two develop in a short time, causing the growth to become thicker and making the next cutting more difficult.

Experimental tests conducted on 13 acres of this typical marsh land brush have shown that controlled spraying of the brush with a water solution of Ammate can be used to give complete control of this type of vegetation at a substantial saving in cost. Comparative costs of chemical versus manual control show that the chemical method effects a saving of about 60% the first season and about 70% the second season of Ammate treatment. It might be reasonably estimated that a saving of 85% or more can be expected with the chemical treatment during the third and subsequent years of operation.

Mechanical Methods

The first and still widely practiced technique of brush control is by means of periodic hand or machine cutting. Hand cutting, done with axes or brush hooks, is a slow and extremely costly method. Depending on the density of the growth, the estimated annual cost of this procedure of brush control can be placed at between $75 and $150 per acre.

Where the terrain is stable, heavy mowing machines, bulldozers, and mechanical saws have been employed in the past few years to bring about a sizable reduction in man-hours required for brush control and right of way maintenance. However, even this technique is considered expensive and, what is more important from a maintenance viewpoint, it is no more effective as a means of killing the brush than hand cutting. Therefore, for years less expensive and more effective techniques have been sought.

One of the more serious disadvantages of the mechanical method of control is that repeated cutting of brush plants tends to increase the density of the plant community and thereby paves the way for more cutting to be done later. Mechanical or hand cutting of sprouts does not kill the root systems but rather promotes more sprouting. It is difficult to kill the root systems of many plants by frequent cutting. Experience has shown that many of the root systems of woody plans cut repeatedly for 15 years are still viable and capable of producing sprouts.

Chemical Methods

The selection of herbicides for control of any particular right of way must be based upon a survey of the type of growth thereon.

A non-selective herbicide should be applied as an overall blanket spray in sufficient water to give uniform and complete coverage of the vegetation. This will result in a high percentage kill of all plants; those not killed will be injured seriously. The following summer a combination of the selective herbicides, such as 2,4,5-T and 2,4-D should be used. Since 2,4-D and the related compound, 2,4,5-T do not affect most grasses past the seedling stage, the broadleaf plants and resprouting brush will be killed while the grasses will continue to thrive. The third and fourth year applications should be spot treatments to eliminate those species of plants which are difficult to kill. Periodic high spot patrol maintenance will eliminate the encroaching plants.

An old right of way which has been cut over with a mowing machine once or twice a year for several years has a dense brush growth some 2 ft tall. The ideal treatment would change this right

At top: Sub-plot 2-B before spraying in June 1949. Bottom: General view of dead plants. Those in foreground are cypress sprouts.

of way into one which is free of all plant growth except the grasses which by competition discourage the establishment and growth of brush seedlings. There is no assurance that such an ideal transformation can be obtained by chemical herbicides but there is reason to believe that it can be approached.

When new rights of way are cut, a very thick growth of sprouts becomes evident the following spring. These sprouts will attain a height of 2 or 3 ft in one growing season. In marshy areas where an abundant supply of water is readily available, sprouts from cut stumps may grow several feet in only a few weeks. This rate of growth may be expected particularly of plants such as willows and marsh elders.

A good practice would be to treat the cut surfaces of all stumps immediately with a strong (4 lb per gal.) Ammate solution. This procedure would tend to reduce tremendously the number of sprouts by killing the root systems of the treated stumps. Those stumps which survived this treatment and produced sprouts would then be sprayed early the next summer with Ammate. This technique would bring about sizable savings in the cost of maintenance.

Ammate (ammonium sulfamate) is not a new chemical herbicide. About 14 years ago sulfamic acid and its salts were investigated for their properties as weed killers. Ammonium sulfamate was found to be more effective in its herbicidal action than the parent compound, sulfamic acid.

Ammate is a non-selective plant killer. When sprayed on plants, it kills by being absorbed and transported through the leaves and stems to the vital parts of the plant. There is very little absorption through the bark of many hardwoods, including oak and elm. Where these have become infested with poison ivy and poison oak, the latter can be sprayed with exceptionally good effect and without injury to the host plant so long as the spray does not reach the leaves of the hardwood.

The killing action of Ammate on plants is quite rapid. Usually, sprayed foliage will show wilting and browning in a very few hours after application of the spray. For effective results, applications of Ammate must be made while green foliage is present. It is best to spray after the leaves have reached full maturity and before fall coloring starts. A good crop of leaves is conducive to good results. The stage of growth seems to make very little difference as long as the plant is completely covered by the chemical solution. Although it is more economical to spray growth 2 or 3 ft tall, growth 18 to 20 ft in height has been killed by a single treatment.

Physiological tests show that Ammate is non-poisonous to man and animal. It has been reported that because of its compatibility with cellulose and fire retarding properties it is used extensively as a flame-proofing agent[1].

Ammate does not sterilize the soil for any length of time, and treated areas can often be used for crops the same season. In a particular case, all vegetation on an Ammate sprayed area was killed, but four months later grasses and broadleaf annuals began to emerge and flourish.

Experimental Work

For the purpose of conducting large scale experiments, an area along a company-owned canal in southern Louisiana was selected. The spoil bank paralleling the canal forms the right of way for the telephone lines.

On this very rich humus spoil bank under the telephone lines a heavy jungle-like growth of brush and tree-type plants thrives. Below these plants, growing in a tangled mass, are briers (blackberries) with very stout hook-like spines. Beneath this steaming green tangle of growth, all species of vermin crawl—a very uninviting and inaccessible place.

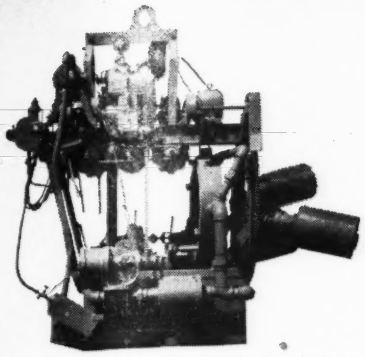
The species of woody plants found growing on the experimental area were these:

1. Marsh elder (Baccharis Halimifolia)
2. Waxmyrtle (Myrica Pumila)
3. Willow (Salix Nigra)
4. Various
   - (1) Blackberries (Rubus)
   - (2) Ash (Fraxinus)
   - (3) Elm (Ulmus Sapp.)
   - (4) Sweetbay (Magnolia Virginiana)
   - (5) Maple (Acer Saccharum)
   - (6) Buttonbush (Cephalanthus Occidentalis)

Marsh elder, waxmyrtle, and willow make up about 95% of the woody plant growth on this area. The growth is typical of that found along canals and other marsh lands in lower Louisiana.

In order to secure the important data and to develop a technique of application, it was necessary to plan and carry out several large scale experiments. A typical area on one of the telephone line

[1]Cupery, M. E. and Gordon, W. E., "Sulfamic Acid," *Ind. and Engr. Chem., 34 (7)*, 792-797, July, 1942.



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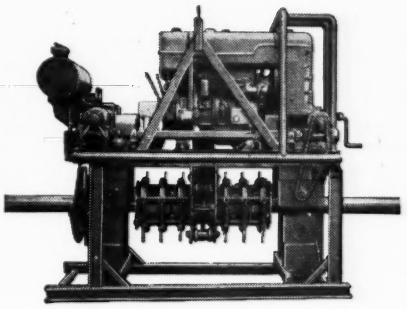
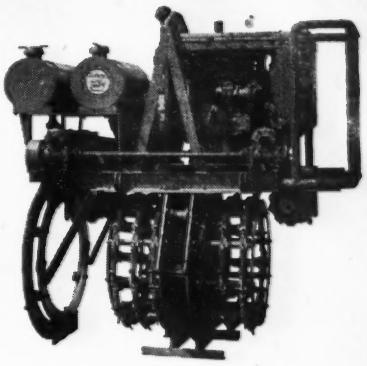


MODEL "M" PIPE CLEANING AND PRIMING MACHINE can be set up to clean and prime pipe from 2" to 14" in diameter. May be used as a line-traveling machine or on a stationary base for yard work.



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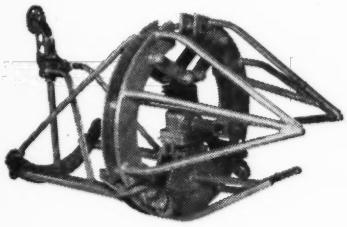

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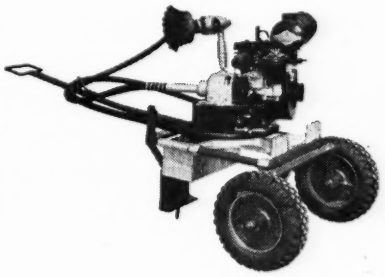

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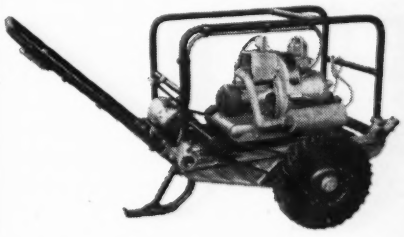

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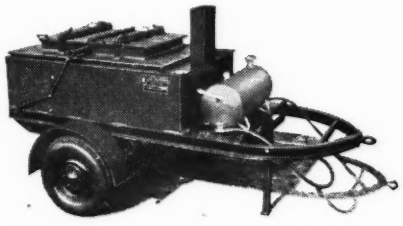

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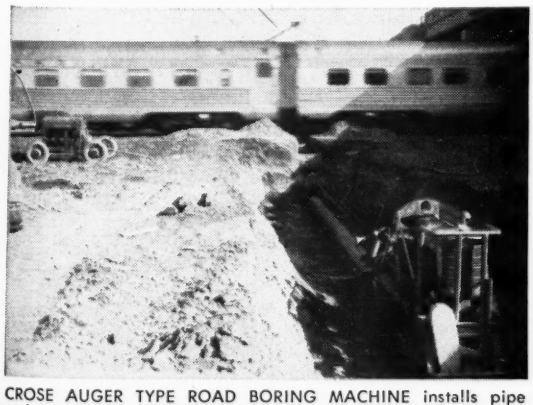

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rights of way which was large enough to be divided into ten acres was selected. For the first phase of the experiments the area was divided into three plots: plots 1 and 2 covering four acres each, and plot 3 covering two acres. Although the experiments were not duplicated, it was felt that the data would have a fair degree of reliability because of the large size of the plots.

On Aug. 30, 1949, the spraying operation was begun and the ten acres covered in two days. The Ammate was applied as a blanket spray in 150 gals. of water solution per acre. It was necessary to do all of the spraying from the deck of a boat, as the use of ground equipment was impossible. At times it was difficult for the boat to move near enough to the spoil bank to insure good coverage of the plants with the solution.

The spray equipment used was a Model 06A John Bean power sprayer with two adjustable orchard-type guns. The equipment was calibrated with water to determine the area which could be covered by 150 gals. of solution.

The effect of the herbicide on all the plants was quite evident the next day. It was very disappointing to note, from the non-uniformity of browning, that complete coverage was not obtained. This was due in part to the inaccessibility of the vegetation from the boat deck, and in part to the density of the growth.

First Application

The first application had the effect of opening up the heavy canopy of leaves, which allowed better coverage of the vegetation on the follow-up spraying. However, it was felt that good coverage must be assured, and operating entirely from the boat deck could not insure complete and uniform distribution of the spray solution on the plants. A means had to be found to elevate one of the spray gun operators about 5 ft above the deck of the boat.

It was decided to build a diving board type platform of heavy timbers on the boat deck with the end of the platform extending 5 ft from the deck edge and approximately 10 ft above the level of the water. This contrivance made it possible for one of the spray guns to operate at a height about 14 ft above the spoil bank. The other spray gun operator could then stand on top of the boat cabin. It was felt that by thus elevating both guns the vegetation could be covered more thoroughly than was possible on the first operation.

For the continuation of the experiments the three large plots were subdivided into ten subplots of approximately one acre each. Each of these was separated by an 80-ft check plot. In addition, three virgin subplots were selected to be used for high volume spraying.

Eight months after the first spraying the follow-up experimental spraying was begun on the ten subplots. Seven of these subplots were sprayed with Ammate varying in rate from ½ lb to 1 lb per 100 sq ft, while three of them were sprayed with a 50:50 mixture of 2,4-D and 2,4,5-T. All ten of these subplots received 150 gals. of solution per acre. In an attempt to provide better wettability and thereby more uniform distribution of the chemical on the plant foliage, 8 oz of a chemical known as "spreader-sticker" were added to several of the solutions.

The three virgin subplots, 4A, 4B, and 4C, were treated with 300 gals. of solution per acre. On two of these Ammate was applied, while the third received a 50:50 mixture of 2,4-D and 2,4,5-T.

Results

Seven months after the first applications of Ammate a critical evaluation of the results was made. On plot 1, which had received ½ lb of Ammate per 100 sq ft and 150 gals. of solution per acre, the destruction was estimated at between 40 and 45%. The kill of marsh elder and waxmyrtle was excellent along the margin of the plot where coverage by the solution was good. Those plants in and near the center of the plot, which were not fully covered by the spray, showed signs of severe injury but were resprouting. The willows which had been cut down some eight weeks before the application of Ammate and had resprouted showed no signs of life. The chemical absorbed and transported through the sprouts was sufficient to destroy the root systems of these plants.

The results on plot 2, which received ¾ lb of Ammate per 100 sq ft and 150 gals. of solution per acre, were estimated to be intermediate between plots 1 and 3.

On experimental plot 3, which covered at a rate of 1 lb of Ammate per 100 sq ft and 150 gals. of solution per acre, the overall kill was estimated to be between 65 and 75%.

Since the quantity of chemical entering the plant determines its herbicidal effectiveness, the increase of percentage kill with higher rates of Ammate is to be expected. This is true since, even with poor coverage, more concentrated solutions will supply more chemical to the plant foliage.

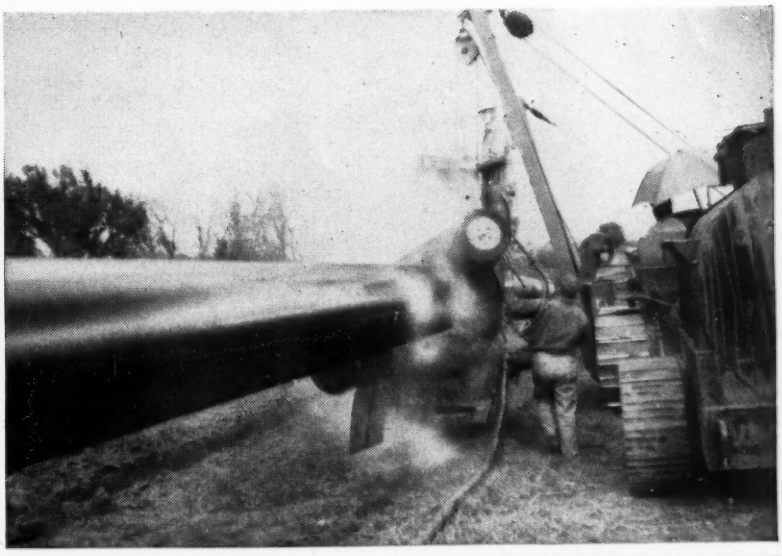
The results of the first spray applications emphasized the value of complete and uniform coverage. This discovery led to the theory that by enhancing the covering ability of the solution, it should be possible to increase the effectiveness of the herbicide. In other words, ½ lb of Ammate per 100 sq ft applied in 300 gals. of water, should give the same results as ¾ lb of the chemical per 100 sq ft, applied in 150 gals. of water. This formula, of course, assumes that 300 gals. of solution per acre will insure complete and uniform distribution of the herbicide over the plant foliage. To shed light on this theory, the three virgin plots of one acre each were used.

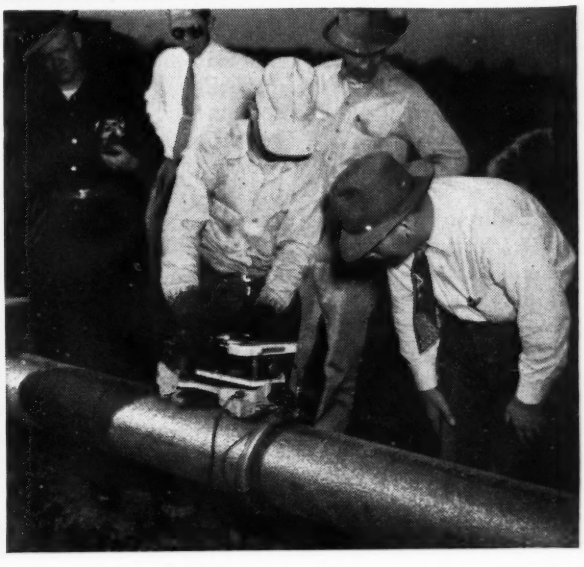
Evaluation

On Aug. 1, 1950, 3½ months after the follow-up spraying, a critical and thorough evaluation of the experimental areas was made. At this time it was possible to walk about on each of the subplots with little interference from the blackberries or brush and make a very close examination of the vegetation. A large number of the plants on each of the subplots was examined, root and top, either by pulling them up or uprooting them with a shovel. On all the Ammate areas, the root systems of plants examined were found to be in an advanced state of decay. Ammate seems to hasten the decay of plants it has killed. Termites were found to be eating into the trunks and roots of many of the plants that were examined. A large number of the plants could be easily snapped at the base by the application of a little pressure against the trunk.

During the evaluation of the sprayed areas it was difficult to find evidence of plants which had survived the herbicide. The percentage kill in most subplots was rated at more than 90%. Several were evaluated as giving more than 99% brush control, and two of these acres looked so completely dead that they were graded 99.9 % kill.

On all of the subplots, Ammate showed a surprisingly high percentage kill on blackberries. On one of these subplots, which originally had a very





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Plant killed with Ammate, viewed from boat, showing dead and decaying root system of the marsh elder (Baccharis Halimifolid).

heavy growth of briers, only one sprout per 300 sq ft was to be found. Many of the root systems which were examined were found to be decaying and black ants had built their tunnels in the pithy centers of the canes. The kill of blackberries on the 2,4-D and 2,4,5-T subplots was not as good as that found on the plots where Ammate was used.

On all of the subplots, with no exceptions, broadleaf annual weeds had sprouted from seeds or roots. These had taken over as a ground cover. This development strongly indicated that Ammate breaks down in a short time and does not permanently sterilize the soil.

Ammate also gave excellent kills on sprouts from cypress stumps which were growing along the edge of the water. These varied in height from 9 to 10 ft.

It is questionable whether the "spreader-sticker" offered any advantage when added to the Ammate solution.

Generally, on the subplots where a mixture of 2,4-D and 2,4,5-T was used, the kill on brush plants was not as good as that where Ammate was employed, even at the lower rates. However, the percentage kill on these 2,4-D, 2,4,5-T subplots may become higher, as it is quite possible the waxmyrtle will not recover.

Subplots 4A, 4B, and 4C were evaluated 3½ months after the chemicals were applied. On these areas 300 gals. of the herbicidal solution were used. The areas showed at a glance the effect of good coverage. On subplot 4B, where Ammate was used at the rate of ½ lb per 100 sq ft, the results were every bit as good as on subplot 4A, where ¾ lb of Ammate per 100 sq ft was employed. These two areas showed evidence of remarkable kills. From 90 to 95% of the tops of marsh elders 20 ft tall were dead and beginning to decay.

There is fairly consistent evidence of bark effect on marsh elder and waxmyrtle. Where the solution hit the limbs and ran down for a short distance, the cambium layer and the bark was found to be dark brown to black, and decaying. This would seem to indicate that, at least on these two species of plants, the Ammate had penetrated the bark and killed the vital cambium layer beneath it. Some fairly large marsh elder plants were found to be in an advanced state of decay down to, and in some cases including, the root systems. This is indeed a remarkable result for a single application and proves beyond doubt that complete coverage, which was possible with the high gallonage solution, will allow a material reduction in the rate of chemical necessary for effective and high percentage plant kills. Sample counts on subplot 4B indicated a 92% top kill, and an estimated 87% total kill of brush-type plants.

On subplot 4C, where a 50:50 mixture of 2,4-D and 2,4,5-T was used in 300 gals. of solution per acre, it is not difficult to see the decided advantage over those areas sprayed with the same chemical combination and 150 gals. of solution per acre. However, the results were not as good as those where Ammate was used under the same technique of application.

Conclusions

Based upon these large scale experimental results, the foliage spray treatment appears to be more economical and effective than conventional hand or mechanical methods. Over comparable rights of way, the initial cost of the chemical technique for brush control will ordinarily be less than the costs of hand or machine maintenance. On some rights of way the initial cost may be somewhat higher than machine control, but never higher than hand methods. Annual maintenance costs will be reduced one-third to one-half over hand or machine methods within a period of three to four years. On some rights of way the second year saving may run as high as 60 to 70%.

The results of these experiments have demonstrated Ammate to be the most consistent and dependable killer of all woody mixed species of brush on marsh land right of ways.

There have been some differences of opinions as to whether low volume sprays or high volume sprays, using water as a carrier, are more effective. The results of the test with 300 gals. of solution per acre indicate that high volume spraying has a decided advantage over low volume applications. The advantage is evident in the high percentage kill which was obtained with the lower rates of Ammate, as compared to the test areas where high rates of the herbicide were used in one-half the volume of water.

Critical observations of the experimental areas have pointed out numerous factors in chemical control and eradication of brush type plants. It has been noted that a greater degree of root kill is usually obtained when comparatively young brush is treated. However, on easily killed species, brush 20 to 25 ft in height has been successfully killed by two applications of the herbicide and greater percentage kills were obtained with the same rate of chemical applied with a larger volume of water.

If Ammate is applied at the suggested concentration and adequate coverage is obtained, a 75% reduction in the brush population can be expected. The second season the chemical may be applied as an overall blanket or as a spot treatment, depending on the uniformity of recovery. These applications will, in many instances, practically eradicate most woody vegetation. The treatments during the third and fourth year will consist of spot spraying designed to eradicate or control those plants which are hard to kill.

To determine comparative cost of chemical eradication against machine and hand control methods, the chemical herbicidal program must be set up on a three- or four-year basis. A period of this length is necessary since the chemical method eliminates root and stock, and each successive year there is a smaller number of plants to treat, requiring less chemical and time. In the machine and hand control methods, the cost is practically the same from year to year.

One of the much discussed problems is the possible injury to valuable plants beside the right of way, and the consequent damage claims which may result. This possibility is not to be completely discounted, but it has been found from actual practice that the intelligent use of high volume solutions has resulted in little if any injury to plants on adjoining properties.

ACKNOWLEDGMENT

The permission of the United Gas Corp. to publish this paper is gratefully acknowledged.

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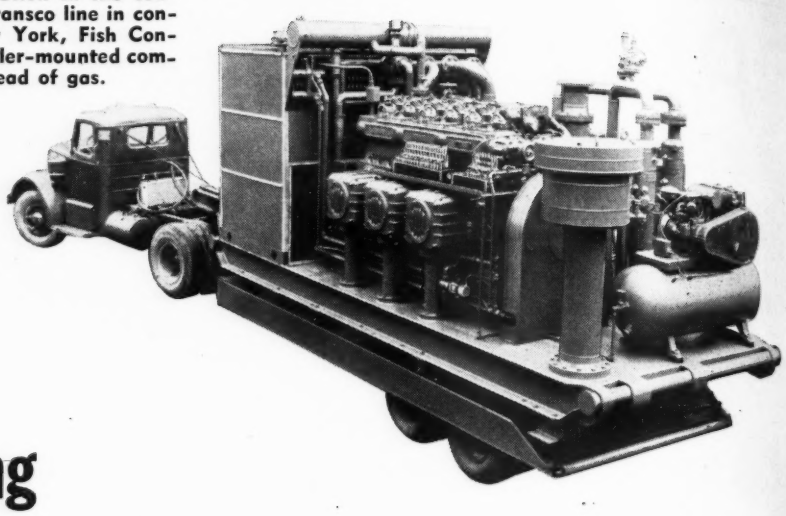
TO ASSURE a safe operation in the conducting of tests on the Transco line in congested metropolitan New York, Fish Constructors selected this trailer-mounted compressor to supply air instead of gas.



Pressure Testing New York City Line with Compressed Air

By FRANK CHILSON

Fish Constructors

Exclusive

FACED with the problem of pressure testing approximately 21 miles of 26 and 30-in. gas transmission pipe in the congested metropolitan New York area upon the completion of the Transcontinental line from Texas to New York City, Fish Constructors, builders of the system for Transcontinental Gas Pipe Line Corp., used compressed air in lieu of natural gas to eliminate potential hazard in the heavily built-up area through which this pipeline passed.

The requirement of pressures up to 850 psig along with large volumes of air made it necessary to look beyond the usual portable diesel driven air compressor for a means of testing the pipe. To accomplish the results desired, Fish Constructors selected for the job a Clark Model MA-6, 225 bhp, 600-rpm gas engine driven compressor. This unit was mounted on a pneumatic tire trailer to provide portability, and the unit was complete with radiator, air filter, muffler, starting air compressor, pressure gauges and all other necessary equipment to make it completely self-contained. Since natural gas for fuel was not available at the locations where the pipe was to be tested, the unit was equipped with a rack containing eight bottles of propane fuel.

The pipeline to be tested contained block valves dividing the 21 miles of length into seven sections. As a means of completing the testing in the least possible time, a program was devised whereby each section could be pumped up to a minimum of 850 psig at a time but which would allow the least number of moves to be made by the portable compressor unit. The discharge of the compressor was connected to the 8-in. blow-off stacks which were located on each side of each block valve, and after a section was pumped up to test pressure and the test completed, a block valve was opened allowing the high pressure air to bleed into the adjacent section of line until pressures were equalized, thus making it necessary only to raise the pressure in each section from approximately 400 psig to 850 psig after the original section had been pressured.

Originally, calculations were made to determine the feasibility of connecting the suction of the compressor unit to the last pressure section of the pipeline and the discharge to the section to be tested in order to take advantage of all work previously expended. However, it was calculated that the constant incremental change in ratio would so complicate the manipulation of the unloading valves of the compressor unit as to make this plan practically impossible. Hence in each case suction was taken at atmospheric pressure.

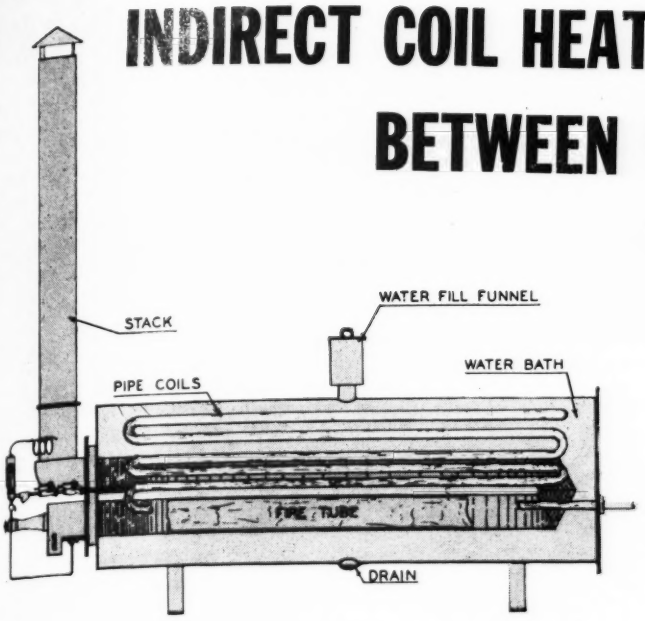
The problem of connecting the compressor unit to the pipeline was solved by using a length of 2½-in., 3000-lb, flexible rubber hose fitted with raised face flanges and gate valves on the ends. The hose made connection less difficult by eliminating accurate location of the compressor unit in relation to the pipeline, and it acted as a means of preventing the transmission of extreme vibration and shock from the compressor to the pipeline structure.

The amount of heat put into the air by compressing from atmosphere to 850 lb was sufficient to raise the temperature of the discharge above that of the melting point of the pipe coating; therefore it was necessary to equip the compressor unit with a radiator cooler containing a cooling water section, an oil cooler section, two air inter-cooler sections and one air after-cooler section. This radiator provided all the necessary cooling services and kept the discharge air temperature at approximately 160°F.

The compresor selected was a three-stage unit equipped with one 13½-in. cylinder on the first stage, one 7-in. cylinder on the second stage and one 5¾-in. cylinder on the third stage. Bypass valves were provided to allow the stages to be cut in and out as suited the pressure conditions during the pumping operation to achieve the greatest amount of air-volume in the least amount of time.

The portable unit will be maintained by Transcontinental for various high pressure testing operations along its 1840-mile system as occasion may demand under future operations. The size of the unit is such that it can be readily transported over major highways without clearance diffiiculties or overload problems. It was found that the selection of this type of compressor saved considerable time and money in keeping the pipeline within the schedule originally established by Fish Constructors for such a large project.

INDIRECT COIL HEATERS PREVENT FREEZEUPS BETWEEN WELLHEAD AND TRANSMISSION LINE



CROSS-SECTION of a skid-mounted, mobile indirect coil heater used to prevent pipeline freezeups following drastic pressure reductions.

By J. E. FOGARTY

INDIRECT coil heaters for use in processing natural gas are rolling out of Graver Tank & Manufacturing Co.'s Sand Springs, Okla. plant, located in the heart of the mid-continent oil fields. Designed and marketed by Union Tank & Supply Co. of Houston, the heaters operate on much the same principle as heat exchangers and function as anti-freezing devices in connection with pressure reduction.

Natural gas, as it issues from the well, is usually at fairly high pressures. These pressures may vary from only a little above atmospheric pressure to 2000 psi, and in extreme cases to as much as 8000 psi. Before the gas can be processed further, it must obviously be reduced to more manageable working pressures. Gas is usually supplied to homes at a pressure of about 4 ozs. and to industry at about 25 lbs. From this, it is evident that in many instances a very great reduction in pressure must be accomplished.

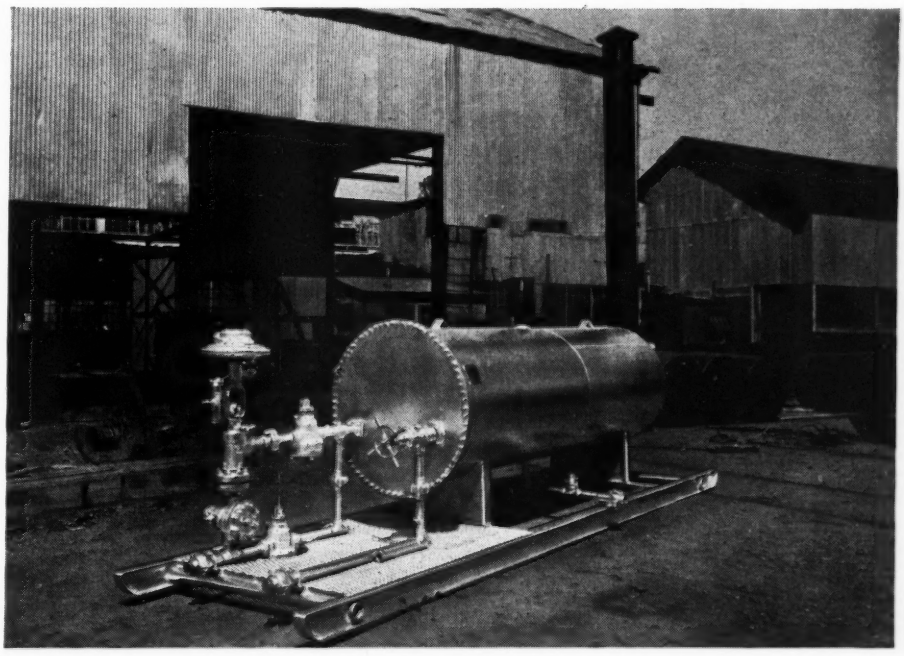
In reducing natural gas from the high pressures at the wellhead to the relatively low pressures for which transmission lines are built, account must be taken of the physical properties of natural gas. In general, when the pressure of the gas decreases, the temperature decreases. Therefore, with the great drop in pressure necessary between the well and the transmission line, there would be a corresponding drop in the temperature of the gas—so great that if the reduction in pressure is attempted without the use of a heater such as Union Tank & Supply's, it is very likely that the low temperatures resulting will cause the gas lines literally to freeze up.

To prevent freezing of the lines and to slow up the drop in temperature, an indirect coil heater like those shown on this page is used. The usual field hook-up for a complete gas well unit is as follows: The gas from the well is piped first through an indirect line heater, where the well pressure is reduced, and then through a field separator; from this the liquid hydrocarbons are drawn off for treatment into gasolines and other products, and the dry gas is fed into transmission lines for further processing and use.

Union's design for the indirect heater fabricated by Graver is an immersion type heater. As is shown in the diagram, the gas is led through coils immersed in a water bath, which is heated by a fire tube fueled by the natural gas. By this means, the gas is heated to a point where the freezing caused by pressure reduction is eliminated. When the gas is warmed to this point, actual pressure reduction is accomplished mechanically by allowing the gas to expand through a small orifice, a choke or pressure reducing regulator installed downstream from the heater.

An example of the necessity for the heating process follows. In the case of a well flowing 3 MMcf of gas a day at a pressure of 3000 psi at a wellhead temperature of 90°F, where it is desired to reduce the gas to 800 psi, the temperature of the gas at 800 psi would be about 25°F, without the aid of a heater. At this temperature, the gas would freeze—in fact, even at 65°F a freezing condition would occur, sufficient to impede the flow of the gas. This example thus shows clearly the necessity for the heating of the gas, before any large reduction in pressure is attempted.

VIEW OF a portable unit, ready for delivery from the plant.



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PIPELINE NEWS

Gulf-Michigan To Build $85 Million Line

Gulf-Michigan Gas Transmission Corp. of St. Louis, Mo., a new company recently formed for construction of an $85 million, 680-mile, 30-in. natural gas pipeline from Monroe, La., to Michigan City, Ind., has applied to FPC for approval and authorization of the project.

The proposed project would initially transmit 350 MMcf of gas per day. The company has contracted to deliver 200 MMcf to Michigan-Wisconsin Pipe Line Co.

William G. Woolfolk, president of American Natural Gas Co., of which Michigan-Wisconsin is a subsidiary, said that the additional delivery would permit the American Natural system to deliver a daily maximum of more than 1 billion cu ft of gas during periods of peak demand.

The additional gas supply will augment the volume of natural gas which Michigan-Wisconsin delivers to its affiliates, Michigan Consolidated Gas Co. and Milwaukee Gas Light Co., and to non-affiliated utility companies in Michigan and Wisconsin.

American Natural's subsidiary, Michigan Consolidated, will receive gas for delivery in Detroit, Ann Arbor, Ypsilanti, Muskegon, and Grand Rapids, Mich. Milwaukee Gas, another subsidiary, will receive gas for distribution to customers in the Milwaukee area.

Supply to nine non-affiliated companies serving 46 communities in Wisconsin and Michigan will be increased. Cities served include Madison, Racine, Kenosha, Green Bay, Kohler, and Sheboygan, Wis.; also Benton Harbor, Grand Haven, Holland, Dowagiac, and Niles, Mich.

The 680-mile main will extend from Perryville, La., across Arkansas, Missouri, and Illinois to a terminus near St. John, Ind., where it will connect with Michigan-Wisconsin's facilities. Gas will be transmitted from connections with United Gas Pipe Line Co. Gas furnished to Gulf Michigan will come from United Gas reserves; thus, reserves were not specified in the former's application to FPC.

The 150 million cu ft of gas not contracted for by Michigan-Wisconsin will be furnished to Laclede Gas Co. and Illinois Power Co. in the St. Louis area.

Preliminary plans call for three compressor stations of approximately 30,800 total horsepower.

Pipe laying is expected to begin in January of 1952 and end in November of the same year. Contracts are slated to be let for pipe laying late this year and pipe is on order with A. O. Smith Corp. of Texas.

The new Gulf Michigan corporation is headed by William G. Marbury, who is also president of Mississippi River Fuel Corp. Mississippi River Fuel plays a prominent ownership role in the new corporation and will furnish key office personnel. Also participating in Gulf-Michigan are Stupp Brothers Bridge & Iron Corp., and other interests.

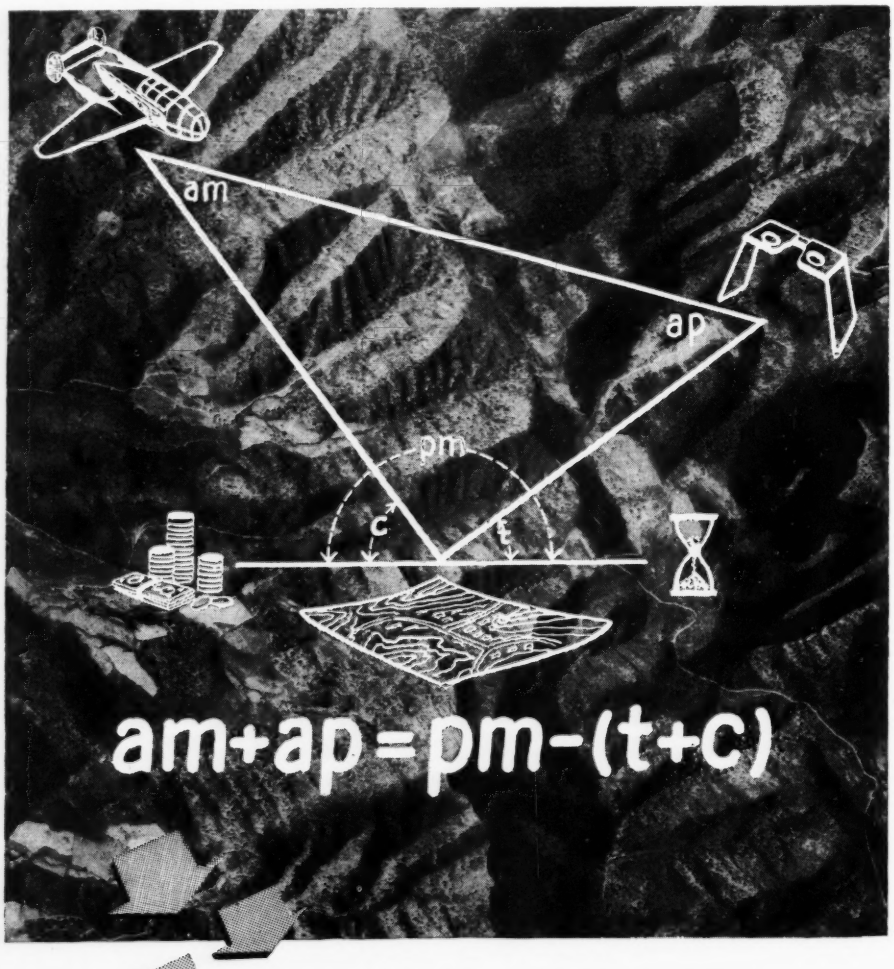
Gulf-Michigan's vice president, E. P. Kramer, will direct a staff that includes an engineering department supplied largely by Mississippi River Fuel. Prior to his present position Kramer was assistant to the president of Mississippi and earlier had served as consultant with Ebasco Services.

Offices of the new firm are located in the same building with Mississippi River Fuel, at 407 N. 8th street, St. Louis.

FPC Approves Northeastern Request for Larger Pipe

Northeastern Gas Transmission Co., Springfield, Mass., will substitute 24-in. pipe for 20-in. on 144 miles of its authorized main transmission line in Massachusetts and lay larger pipe on five of its laterals in the state. Authorized main lateral lines total nearly 511 miles.

Northeastern will use the larger lines to meet emergency demands arising from interchange of natural gas with any other



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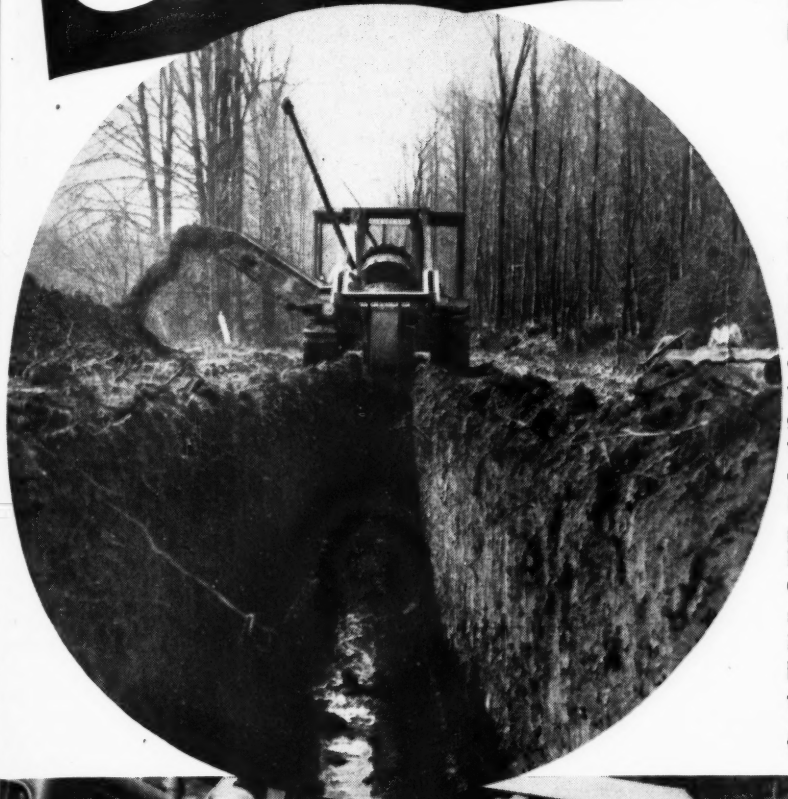

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transmission company in New England, to extend service north of its present Massachusetts market and also in Maine, New Hampshire and Vermont, and to provide service to its presently authorized customers.

The company estimates that these and eventual demands will increase present estimated peak day requirement of 207 MMcf to 282 MMcf within five years. Additional cost of the pipe over the formerly authorized main and lateral lines is estimated at $2,314,000.

The 144 miles of 20-in. line was authorized by the Federal Power Commission last November. Northeastern precluded itself from receiving the 20-in. pipe on Jan. 5, 1951, according to the commission, and was not eligible to receive delivery until December of this year. Application for the larger pipe was filed in December, 1950.

The commission authorized construction with 24-in. pipe to forestall delay of service to the company's New England markets.

Cities Service Installs Two-Way Radio System

Cities Service Gas Co., now in its seventh year of a $65 million construction and improvement program, has initiated two-way radio communication in the area surrounding its Hugoton, Kan., 20,800-hp compressor station.

The company has installed 13 60-watt Motorola mobile units on the vehicles serving its gathering system in the Hugoton field. The new service covers a radius of about 35 miles from the Hugoton station. The installation includes a 250-watt central transmitting station and antenna tower which will operate on a 159-megacycle band.

For some years the company has maintained a company-owned pole-line telephone network. Over these lines the dispatching department makes hourly checks throughout its territory on weather, pressure, and other operating data. The calls include each of the company's 26 compressor stations.

In another phase of its construction program, Cities Service recently began revamping of yard piping and the installation of water cooling equipment at Petrolia, Kan. on its main transmission system from Oklahoma to Kansas City. This includes moving of air tanks to a new location and completing the overhead floor on the new pump pit in the auxiliary building.

At Welda, Kan., the company is installing three 100-hp Cooper-Bessemer compressor units, bringing the capacity of that station to 6400 hp. At the Craig field booster station west of Kansas City, 600 hp has been added. Remaining work at Welda and Craig consists of grading and yard work.

Offshore Gas Moves Through Ocean-Going Line

The first natural gas movement to originate in the offshore tidelands area of the Gulf of Mexico began at Rollover field, 10 miles from shore, late in March. The gas was pumped into Tennessee Gas Transmission Co.'s system near Lake Charles, La. through Marine Gathering Co.'s ocean-going pipeline (*GAS*, Feb. 1951, p. 78).

Gas previously had been obtained from tidelands areas through lines laid across lakes and protected bays, but this marked the first movement of gas from the open waters of the gulf.

C. S. Coates, vice president of TGT, said the company's Louisiana gathering system has been extended into the southern part of the state to connect with the Marine Gathering system.

Manufacturers Files Plan For 172-Mile Line

Manufacturers Light & Heat Co., Pittsburgh, has filed an application with FPC for authorization to build 172 miles of 16-, 20-, and 24-in. line, together with measuring stations and river crossings, extending from a point in Gallagher township, Clinton county, to a point northwest of Cannonsburg in Washington county, Pa.

Maximum capacity of the line, which would deliver gas from producing fields in Clinton county to the Pittsburgh area, is estimated at 105 MMcf daily. The project would be financed by Columbia Gas System, Manufacturers' parent.

The application requested that FPC either approve the construction or find the project not within the commission's jurisdiction.

Efficient Equipment is Necessary for Effective Disaster Control

- Minimum Pipe Line down time.
- Cuts under water in flooded ditches.
- No broken pipe, milled cut.
- Thor Air-Powered, no flames near pipe.
- Set-up time about 15 minutes.
- Portable — weighs only 265 lbs. Two men can carry and set up unit.
- Small excavation — only 16" clearance needed.
- One machine cuts all pipe sizes from 10" to 48".
- Only two adjustments necessary to change sizes.

You will need the most modern Pipe Cutting equipment in order to make prompt restoration of service in the event of "Bomb" damage. Smashed gas and water mains and sewers give a tremendous urgency for prompt repairs.

This portable milling machine on wheels, can serve and save on regular construction and replacement programs. It can be a life saver if an emerency hits your city.

Here is a fast, portable pipe cutting machine that will take all sizes of cast iron and steel pipe from 10" in diameter on up. Makes cuts under water or in the presence of explosive mixtures. Adequate Civil Defense Protection requires that you have one or more of these machines available in your city.

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FOR PROTECTING YOUR PIPELINES WITH BARRETT* COAL-TAR COATINGS

1. **BARRETT coal-tar enamels** and application procedures are available for every pipe-coating use in the oil and gas field, and for use under all types of climatic conditions and topography.
2. **Barrett makes coal-tar enamels** in grades that will not crack at —20°F., nor flow at 160°F.
3. **BARRETT coal-tar enamels** possess high ductility and flexibility in all grades, and show high resistance to soil stresses.
4. **BARRETT coal-tar coatings** adhere closely to the pipe, and are not damaged by "breathing," nor by deflectional stresses caused by loading of the back-fill.
5. **BARRETT coal-tar enamels** have high dielectric properties—require less "outside" current to make cathodic protection effective.
6. **BARRETT coal-tar enamels** are impermeable to moisture.
7. **BARRETT coal-tar enamels** are resistant to attack by gas and petroleum products.
8. **Another advantage** of BARRETT coal-tar coatings is the widespread experience of the engineers and contractors who have worked with them.
9. **Also, their universal availability** and ease of application, through applicators all over the country.
10. **And last, but not least,** the Barrett organization is always at your disposal to advise on materials and on application procedure, and to consult with you on any pipe-coating problem.

*Reg. U. S. Pat. Off.

Barrett*

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
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Bill Would Permit Alberta Gas Export

Late in March a bill to permit the first large-scale export of Alberta natural gas to the United States was introduced in the Alberta legislature. The fuel would be destined for Anaconda Copper Mining Co. of Montana.

Anaconda reportedly is prepared to construct a 21-mile pipeline from the Pakowski Lake field in southeastern Alberta to the border and a 35-mile line from there to the Cut Bank, Mont. field where it would join Montana Power Co. lines to copper plants at Butte, Anaconda, and Great Falls.

Premier Manning said the bill is purely a defense measure. It provides for export of 10 billion cu ft a year for five years. Introduction of the bill followed a request from Charles E. Wilson, U. S. director of defense mobilization.

Ohio Fuel Proposes Line To Meet Present Demands

To enable it to meet increased demands in existing markets and to provide for future growth of those markets, Ohio Fuel Gas Co., Columbus, has asked the FPC to authorize construction of 61.3 miles of line in northern and southwestern Ohio.

The proposed construction consists of 16.5 miles of line in Erie county, 23.1 miles in Lorain county, 8 miles in Warren and Montgomery counties, and 13.7 miles in Madison county. As a result of the construction, Ohio Fuel plans to retire and remove approximately 37.3 miles of existing line. With the construction cost estimated at $2,690,000, allowing for retirement of the 37.3 miles of line, the company states the net increase in investment would be $2,402,870.

Railroad Commission Denies Price Fixing Authority

The Texas Railroad Commission has ruled that it has no authority to fix natural gas prices at either minimum or maximum levels and that it can find no state ruling where "by implication" the commission could exercise such authority.

The decision was made in answer to a request for establishment of a minimum price on natural gas by the Panola County Royalty Owners Assn., made several weeks ago. Several such associations, including Sherman County Royalty Owners Assn., have protested irregularities in prices.

Commission Chairman Olin Culberson added a supplementary statement to the ruling in which he said that "though the commission now has no power to do anything about it, the lack of a fair price will shorten the life span of the resource and the industry and allow continued dissipation of gas to the detriment of the state's economy."

The Texas House committee had, however, approved a bill the day before the ruling was rendered that would allow the commission to set minimum field prices. The senate must still take action upon it.

Pipeline Problems

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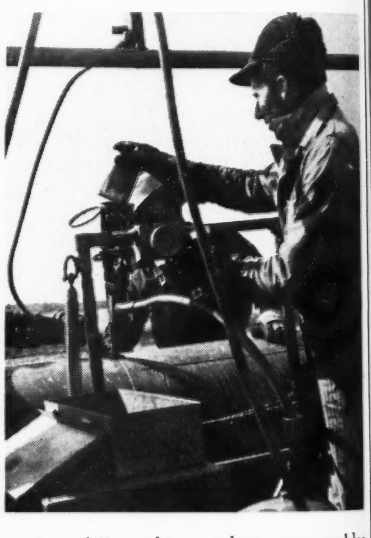


A mobile, submerged-arc type welder is used for double jointing pipe on Oklahoma Natural Gas Co.'s 53-mile, 26-in. line leading to its underground storage area at Depew.

Worker is shown putting flux in the hopper which feeds down to the point of welding.

Trojan Construction Co., Oklahoma City, is the contractor on the job.

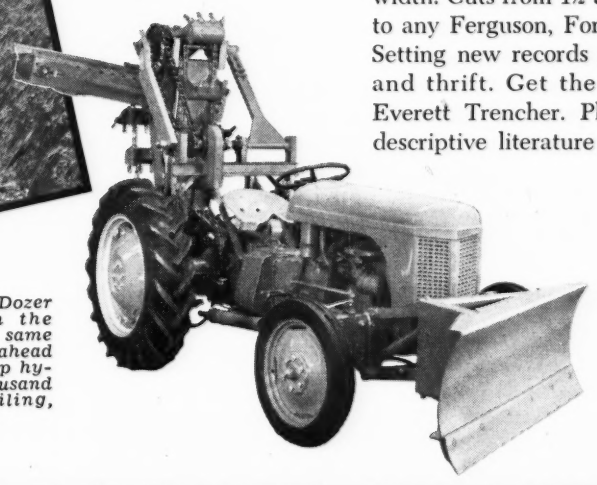
SAVE TIME AND MONEY WITH

The EVERETT TRENCHER

Does Pick and Shovel work of 25 men.
Low in initial cost—low in upkeep.

Cuts the cost while it cuts the trench. Soon available also in 6 to 8 inch widths.

For *straight, clean, quick* gas line ditching, you'll be time and money ahead with the Everett Trencher. Comes right up to houses. Breaks off sharp at sidewalks. Rugged, yet so light in weight, you can take it over curbs, lawns, roughest terrain. Digs up to 42 inches deep—12 to 18 inches in width. Cuts from 1½ to 5 feet per minute. Attaches to any Ferguson, Ford-Ferguson or Ford Tractor. Setting new records everywhere for performance and thrift. Get the details and you'll get the Everett Trencher. Phone, write or wire for full descriptive literature *today!*



(Right) The McGee Angle Dozer can be teamed up with the Everett Trencher on the same tractor. Dozer moves dirt ahead or to the side with finger-tip hydraulic control. For a thousand leveling, back-filling, piling, scraping and cutting uses.

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PG&E Plan Would Increase Deliveries by 150 MMcf

Construction, at an estimated cost of $19,391,000, of facilities which will increase the capacity of the Pacific Gas & Electric Co.'s Topock, Ariz. to Milpitas, Calif., pipeline by approximately 150 MMcf of natural gas per day is now awaiting authorization of the FPC.

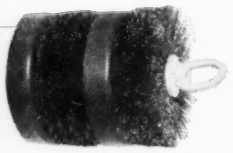
Plans call for the laying of two parallel sections of 34-in. pipe along the existing Topock-Milpitas line and the addition of 22,780 hp in compressor capacity at authorized stations.

The company, which serves 28 counties in central and northern California, says the additional capacity is needed to meet increased load demands in its existing service area. PG&E will receive the additional gas from El Paso Natural Gas Co., from which it is now authorized to receive 400 MMcf of gas per day, for transportation through the Topock-Milpitas line.

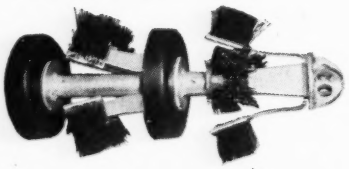
The El Paso company currently has two applications pending for construction of facilities to supply the additional load to PG&E.

THE PIG WITH THE POKE — CLEANS PIPE LINES

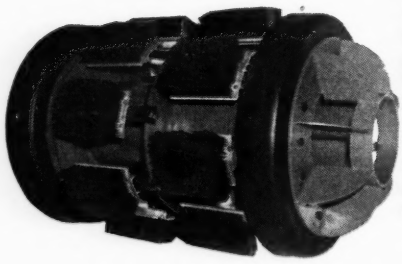
THE VERY LATEST
Williamson Pipe Line Pigs*
FOR CLEANING
NATURAL GAS PIPE LINES



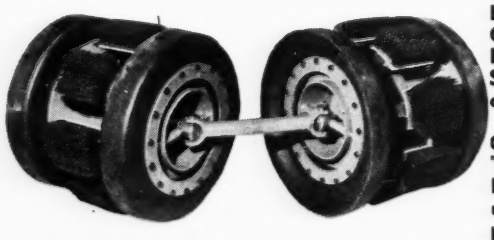
4" Size—TYPE JRN—2" to 4" sizes. Will pass 1½ R-90° Bends. No valves other than full diameter thru port valves. Use TYPE SCN-51 for 6" size.



8" Size - TYPE WC-11 - 8" to 14". Will traverse 6-foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.



20" Size - TYPE GP-2 - 16" to 30" 200-lb. SPRING forces the brushes against pipe wall — COMPENSATING for WEAR. Will traverse round opening gate or plug valves. SPRINGS and BRUSHES are identical and interchangeable for all types and sizes of GP-PIGS.



24" Size - GP-3 - 18" to 30". Sizes will pass 1½ R-30° Bends. SPRINGS COMPENSATE for BRUSH WEAR ASSURING full section cleaning efficiency.

GP-3 consists of two Type GP-1 Pigs—Each Unit may be used as individual pig.

*Patents Pending

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

Compressor Planned

Atlantic Seaboard Corp., Charleston, W. Va., has applied to the FPC for authority to construct a 3520-hp compressor station in Randolph county, W. Va., on its Cobb-Rockville 26-in. line, to provide additional capacity to meet the 1951-52 peak day and winter volumes of present natural gas customers. Atlantic operates pipeline facilities located in Kentucky, West Virginia and Maryland.

The proposed station would contain four 880-hp gas engine driven compressor units. Estimated cost of construction is $1,350,000, which would be financed through sale of securities to Atlantic's parent company, Columbia Gas System Inc.

Ohio Construction Proposed

Increased demands in existing markets in the Sandusky, Elyria, and Dayton areas has prompted the Ohio Fuel Gas Co., Columbus, to request authority for construction of 61.3 miles of natural gas transmission lines in northern and southwestern Ohio.

The proposed project includes roughly 16.5 miles of line in Erie county, 23.1 miles in Lorain county, 8 miles in Warren and Montgomery counties, and 13.7 miles in Madison. Ohio Fuel plans to retire and remove about 37.3 miles of existing line.

Cost of construction is estimated at $2,690,000. Service to new areas is not involved.

United Gas Contracts Let

Gulf Southern Contractors, Fort Worth, has been awarded a $25 million contract for construction work on about 1000 miles of line for United Gas Pipe Line Co., Shreveport.

Gulf Southern is composed of Texas-Louisiana Contractors, Fort Worth Oklahoma Contracting Co., Dallas; J. Ray McDermott & Co. Inc., New Orleans; and Morrison-Knudson Co. Inc., Boise.

Previously, a contract was let to Brown & Root Inc., Houston, for various engineering, construction, and other services on the project.

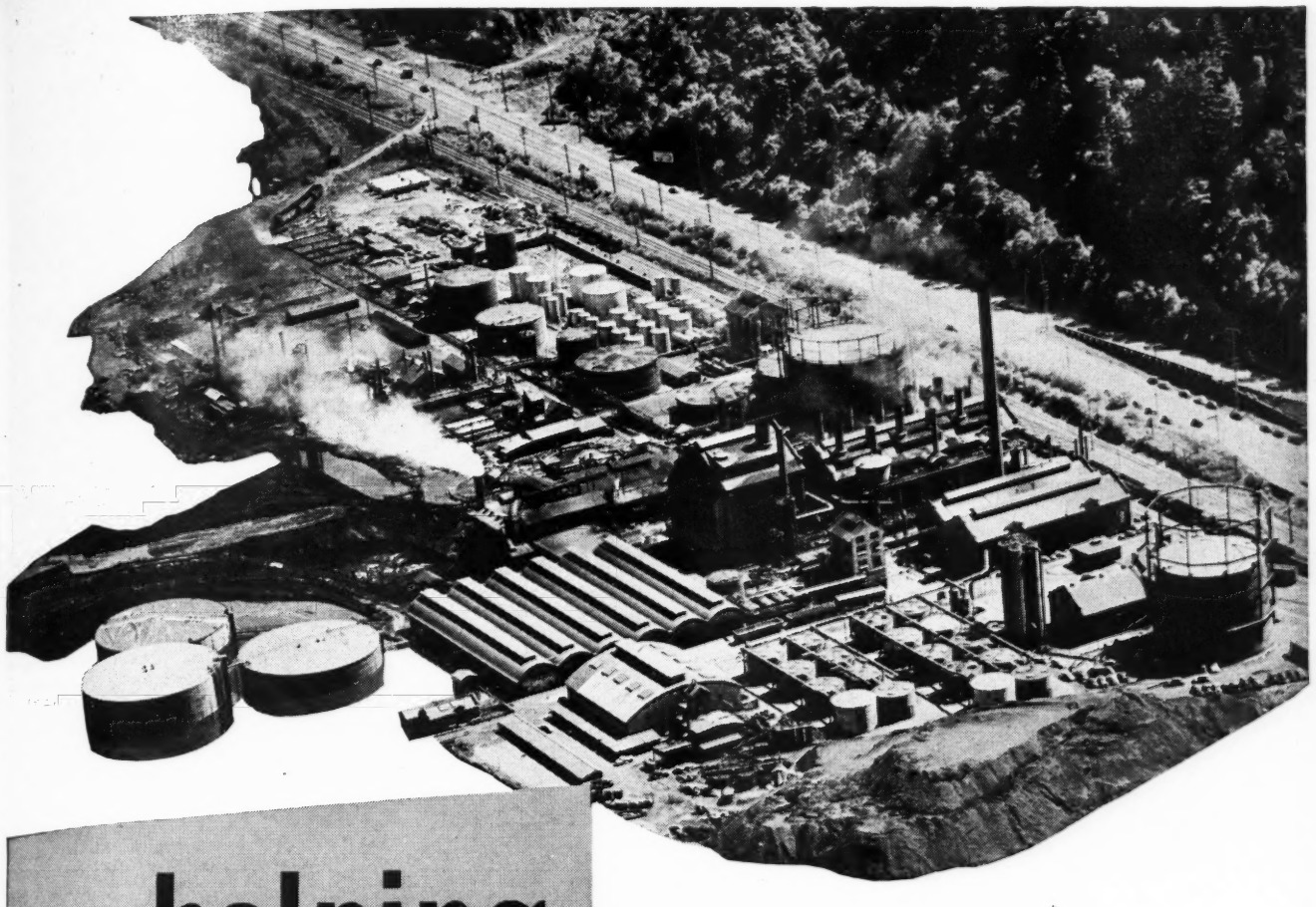
Alford Field Plan Approved

Texas Gas Transmission Corp., Owensboro, Ky., has been authorized by the FPC to construct natural gas facilities to connect and operate the Alford underground storage field near Petersburg, Ind.

The facilities, estimated to cost $938,811, include 12 miles of connecting line, a 1200-hp compressor station, a storage measuring station, and 4.5 miles of storage field lines. This construction will make available from storage a capacity of 30 MMcf per day.

FPC Okays Interstate Line

Following its approval in March of Colorado Interstate Gas Co.'s acquisition of Ca-



helping

the Pacific Northwest meet its gas needs

This manufactured gas plant of the Portland Gas & Coke Company at Portland, Oregon, is the largest in the Pacific Northwest with a capacity of over 50,000,000 cu. ft. per day. Conversion of thirteen existing generators to "rapid cycle" operation and installation of automatic controls increased capacity 16,500,000 cu. ft. per day. This work including installation of a new 6,500,000 cu. ft. per day oil-gas generator was recently engineered and constructed by EBASCO.

But big jobs are nothing new to EBASCO!

For over 40 years, EBASCO has provided a large number of companies producing manufactured gas with *specialized* assistance in constructing complete new plants and improving and expanding existing facilities. Through *one organization*, EBASCO can supply the experience and technical talent needed to handle *any* job, from planning to "in-service" operation.

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nadian River Gas Co., both of Colorado Springs, and Commissioner Buchanan's dissenting statement, the FPC issued an opinion supporting its action.

Four members of the five-man commission outlined reasons for the decision and the processes by which they reached it and stated that "denial of the application would have been a distinct disservice to the public."

Several days later, FPC set a hearing to begin Aug. 1 on the rates of the two companies. In September 1948, when the rate investigation began, the commission said that rates charged by the companies "may be unjust, unreasonable, unduly discriminatory, or preferential."

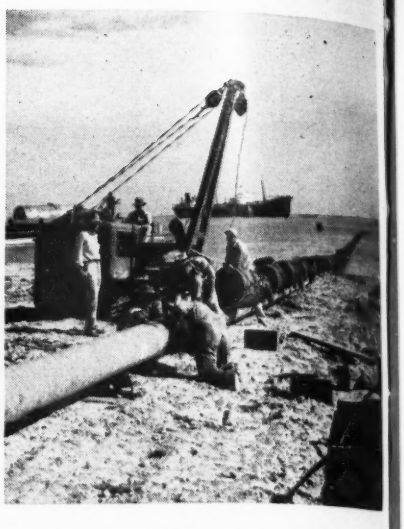
Southwesterners Discuss Conservation Measures

More fuel was added to the fires of controversy surrounding proposed conservation of Southwestern states' gas resources at a special meeting held recently at Ardmore, Okla.

Gov. Johnson Murray of Oklahoma told state dignitaries and natural gas industry officials from Texas, Kansas, and Oklahoma that the Southwest should "build its own industry and protect our economic system. We should not peddle our gas back east where they already have coal and fuel oil in abundance."

Kansas Gov. Edward Arn pledged his support to the proposal, suggesting that "it be made crystal clear to the Federal Power Commission that the mere granting of a certification for construction of a pipeline is not a guarantee of uninterrupted flow of gas to the states back east."

Sen. Grady Hazelwood of Amarillo, Texas, said that his state would soon have have to find new sources of revenue, apparently referring to the belief held in some quarters that Texas' natural gas resources are being rapidly depleted.



Tennessee Gas Transmission Co., which recently began taking gas from the open waters of the Gulf of Mexico through the Marine Gathering Co. line (described elsewhere in this issue), recently completed the line shown above. This one runs to gas fields on Mustang island, off the coast of Corpus Christi, Texas.

United Plans Construction

United Natural Gas Co., Oil City, Pa., has asked FPC to approve construction of new facilities in northwestern Pennsylvania, estimated to cost $745,000.

The company wants to build 10 miles of new line, to relocate and replace two miles of pipe, and to replace more than eight miles of line. In addition, United would add a 150-hp unit at its Hickory compressor station and another at its Pinegrove station. A 100-kw, 240-volt generator would be installed at Knox station.

Hope Natural Plans Line To Terra Alta Field

Hope Natural Gas Co., Clarksburg, W. Va., is seeking authorization from the Federal Power Commission to construct a 32-mile, $831,200, pipeline in West Virginia connecting the company's natural gas transmission system with the Terra Alta gas field.

The line will extend east from the Fairmont area to the Terra Alta field, located in Preston county. While the line would be

31 Years Behind
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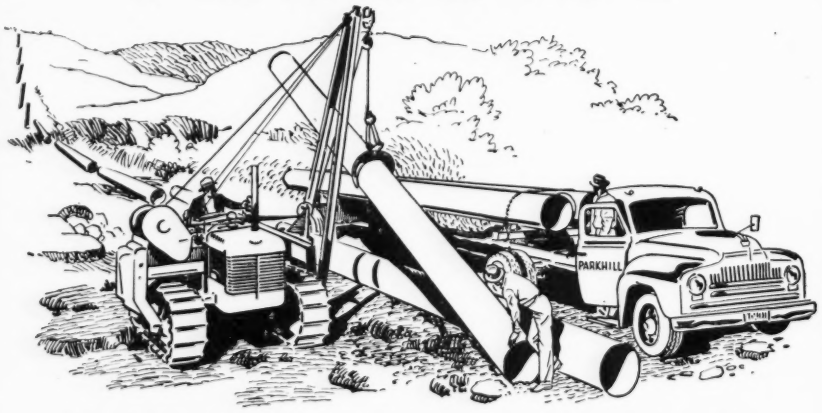

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- "KNOW HOW" . . . gained through 31 years of broad experience under all seasonal, climatic and topographical conditions.
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- COMPLETE SERVICE . . . through the building of an organization of engineers, skilled workmen and trained crews for quick, safe, practical teamwork with contractors.

Whether your job is a "Big Inch" or "Little Inch," regardless of location or terrain, you can depend upon Parkhill any time, any place you need a pipe stringing job.

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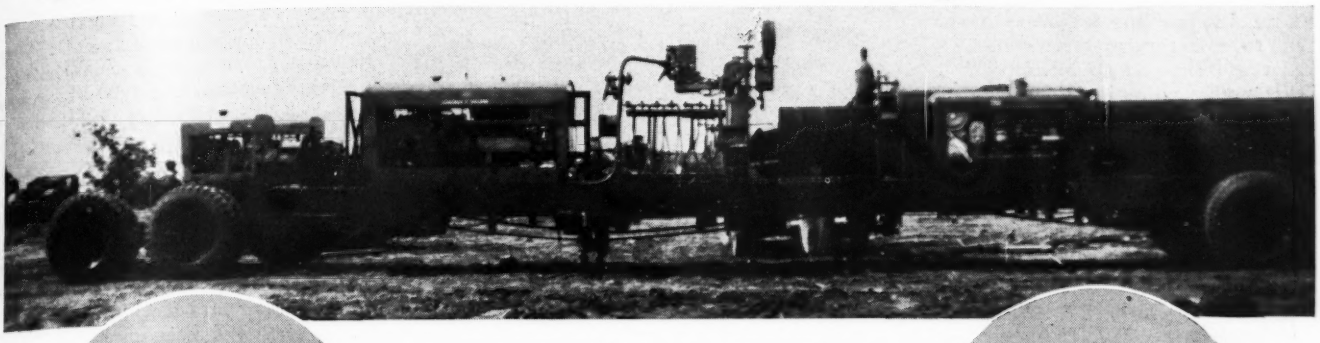
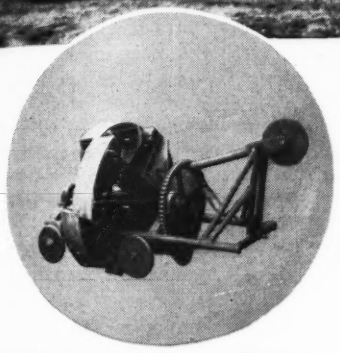
O. R. SMITH DEVELOPS COMPLETE LINE OF PIPELINE WELDING EQUIPMENT





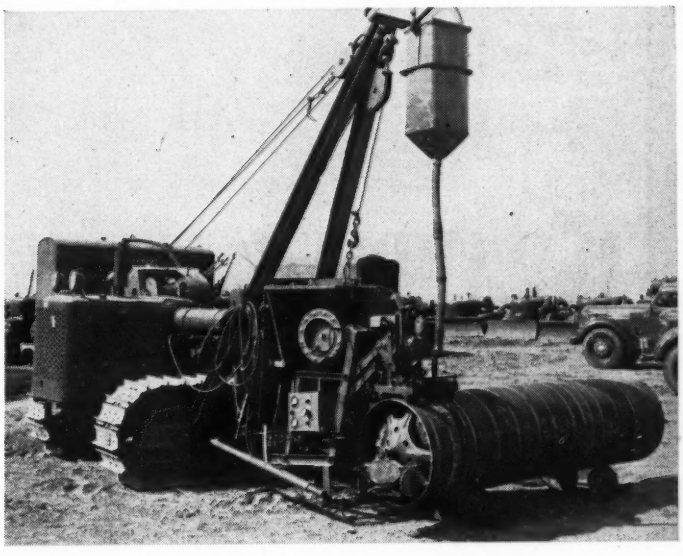
30" Internal Lineup Clamp

The Smith Portable Pipe Yard Double Jointing machine which made up to 100 welds per day on the Virginia Section of the 30" Transcontinental Line from Texas to New York. This machine can be used for down the right-of-way welding. Provision is made for fitting Athey tracks.

20" River Crossing Clamp

Light type Smith 16" demonstrating machine which will weld up to 5 joints of 40' pipe into 200' sections. Ideal for small spreads, pipe yards or refineries. Easily handled and operated by a small crew, it will produce quality welds economically.

This equipment can be rented for use by your own organization.



The latest Smith 16" to 30" portable submerged-arc welder for welding line pipe under field conditions. Mounted on a tractor, it will negotiate the roughest terrain and heavy going down the right-of-way. Units are available for welding 16", 20", 22", 24", 26" and 30" pipe. Arrangements for welding special sizes and river crossings can be arranged at short notice.

O. R. SMITH *Pipe Line Specialists*

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used primarily to transport gas from the Terra Alta field to its distribution area in Fairmont, it is probable that at times gas from the proposed line may enter its general system and be sold in interstate commerce to present customers.

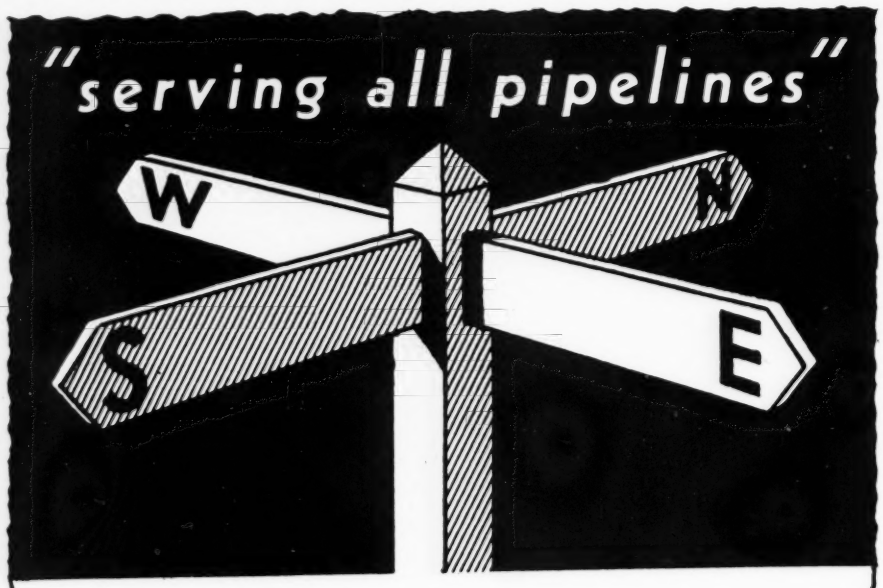
Hope estimates that one-half trillion cu ft of gas reserves may be available from the Terra Alta field and an adjacent new field, and states that proven reserves in the Terra Alta field alone are 35 billion cu ft. However, until supplies in excess of 25 million cu ft per day are available from the area, no gas will be available during winter months—and possibly other months as well—for its markets outside of West Virginia.

Texas Gas Amends Plan

Texas Gas Transmission Corp., Owensboro, has amended its application seeking FPC authority to expand the capacity of its system.

Originally, the company proposed to build 578 miles of main, lateral, and loop lines and add 13,740 hp at an estimated cost of $42,310,000. As amended, the application provides for construction of 642 miles of line and 14,620 hp. The revised cost estimates is $46.6 million.

In addition, Texas Gas now proposes to sell up to 90 MMcf of off-peak gas daily to a new industrial customer located near Paducah, Ky.



PIPELINE COATINGS

and

WRAPPING MATERIALS

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Depew Storage Project Nearing Completion

Work on Oklahoma Natural Gas Co.'s underground storage project near Depew will be finished sometime this summer, the company has reported. The 1900-acre area will hold 50 billion cu ft of gas 3250 ft below the earth's surface.

Eight input wells will be used to channel gas obtained at various points in Oklahoma to the rock formations. Power to force the gas into the earth will be furnished by a four-unit, 4400-hp compressor station. Faulty well-holes have been plugged to prevent the escape of the stored fuel, 10 billion cu ft of which has already been injected.

W. R. Kubista, chief engineer, reports that the annual turnover of gas at the site will be about 14 billion cu ft. A total of 200 MMcf can be withdrawn in one day, and will be destined for use in Tulsa, Oklahoma City, and other cities in the eastern part of the state.

Gas for Depew will come from fields at Enid, Crescent, and West Edmond. About 85% of the fuel will be residue gas from gasoline plants.

Austin Field Pipe Line Co. Acquired By MichCon

Facilities including a 24-in. 140-mile line from the Austin storage field in Michigan to Detroit, and a metering and regulating station at the Detroit terminus of the line, are to be acquired by Michigan Consolidated Gas Co., Detroit, from its subsidiary, Austin Field Pipe Line Co. Federal Power Commission approval has been granted.

Michigan Consolidated will also acquire from Austin a compressor station located in the Austin field. The station is currently operated by Michigan-Wisconsin Pipe Line Co., an affiliate, under lease from MichCon, and the arrangement will be continued.

Stock of the Austin company will be cancelled. All outstanding stock is owned by MichCon.

Dowell Laboratory Opened

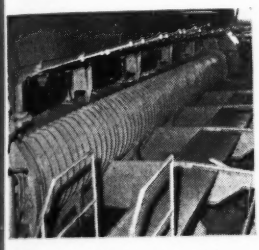
Dowell Inc., Tulsa, has opened a new district laboratory in Midland, Texas, to offer fast, improved service to operators in the Permian Basin area. It will be operated as a branch of the firm's main chemical research laboratory in Tulsa.

James O. Means, former research chemist in Tulsa, will be in charge of the new laboratory, which is fully equipped for testing of all types of oilfield samples.

More Gas for Cincinnati

Central Kentucky Natural Gas Co., Charleston, W. Va., has asked the Federal Power Commission to authorize construction of 12.8 miles of 20-in. pipeline, making available an additional 52 MMcf of natural

Water diet for stronger pipe



AFTER Basalt-Kaiser Steel large diameter line pipe has been formed and welded, it is expanded by *water* under great pressure in this modern hydraulic expander.

Result: Increased strength, due to additional cold working. And unusual accuracy in concentricity, diameter and straightness.

Kaiser Steel pipe, manufactured to conform to latest API specifications—in diameters from ½ inch to 30 inches, and in lengths up to 55 feet—is being produced. Shipping points are Fontana and Napa, Calif.

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Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 22" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5 9/16" to 12¾" O.D.	Up to 55'	.188" to .400"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	24" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

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gas daily to customers in the Cincinnati area.

This program would increase the company's capacity from 247 MMcf to 299 MMcf per day, the latter figure being the area's estimated peak day requirements for the winter of 1951-52.

The proposed new section of line, estimated to cost $780,000, would loop the company's existing 14-in. line extending northwestward from North Means, Ky. Central Kentucky plans to finance the construction by issuance and sale of securities to its parent company, Columbia Gas System Inc.

Pipeline Coating Jobs Awarded to Price

H. C. Price Co., Bartlesville, Okla., recently announced that final preparations were being made for several large pipeline coating jobs.

The company has a contract to apply its Somastic coating on 137 miles of line to be built in south central Louisiana as part of United Gas Pipe Line Co.'s recently approved construction project. For this job, a plant is being set up near Morgan City, La., under the supervision of R. P. White, gulf coast division manager.

On March 22 Price crews at the Harvey, La. plant set a record high when 296 16-in. OD joints received a 9/16-in. coating. This averaged about 20 ft per minute during the day's operation.

Two extensions of the Transcontinental Gas Pipe Line Corp. system are to receive Somastic and Hevicote applications, according to the Price company. They include a 10-mile, 26-in. line across Staten Island, a 4-mile, 24-in. line for the Narrows crossing of the Hudson river, and a 15-mile, 24-in. section from the east side of the Hudson to the Connecticut border.

CPS HAS THE MATERIALS . . . KNOW-HOW . . . FACILITIES

TO . . .

STOP THAT CORROSION!

ON LAND! Pipelines, Tank Bottoms, Gathering Systems, Gas & Water Distribution Systems

*ON SEA! Offshore Drilling Platforms, Offshore Pipe Lines, Wharves, Piers, Ships, Barges, Drydocks, Wellheads

IN THE AIR! Water Tanks, Condenser Heads

CPS OFFERS A complete sales, engineering and installation service

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2. YEARS OF "KNOW-HOW"
3. COMPLETE FACILITIES

CPS handles only first line materials made by famous well known manufacturers. DOWELL Magnesium Anodes — GENERAL ELECTRIC Rectifiers — MALONEY Insulating Materials —M-SCOPE Pipe and Cable Finders — CADWELD Welding Supplies — RUBICON Potentiometers—Soil Resistivity Apparatus—HOLLOWAY Shunts—Miscellaneous instruments.

*These structures are usually protected most economically by a combination of CATHODIC PROTECTION and the ELECTRO-COATING PROCESS to which CPS holds exclusive license under U. S. Patent Numbers 2,200,469 and 2,417,064.

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TULSA, OKLAHOMA
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Everything in the Cathodic Protection Field from an Insulating Washer to a Turnkey Contract Installation

FPC Affirms Decision

The plan of Interstate Power Co., Dubuque, Iowa, to construct a 26.5-mile, 8⅝-in. pipeline to carry natural gas to Clinton, Iowa, at an estimated capital cost of $749,000, has been okayed by the FPC. Natural Gas Pipeline Co. of America, Chicago, has been directed by the commission to supply Interstate with up to 2733 Mcf of gas per day.

Interstate, which now serves manufactured gas in Clinton, will connect the new line with Natural's system near Hooppole, Ill. The line will extend from the Hooppole area, with a submarine crossing of the Rock river, to the west side of the Mississippi river opposite Clinton. Gas will be carrried across the Mississippi through a double submarine crossing.

Compressor Station Okayed

The FPC has authorized Equitable Gas Co., Pittsburgh, to construct and operate a new compressor station and other natural gas facilities in Washington county, Pa. at an estimated cost of $1,055,739.

The project will include the New Dennistion station, consisting of three gas-engine driven, 1100-hp compressor units and connecting pipelines; a glycol dehydration plant; gas scrubbers; and auxiliary equipment.

The new station will replace an existing one and will compress gas into the company's Finleyville, Tepe, and Bunola underground storage pools. Equitable estimates that with the new station, a maximum volume of 13 billion cu ft of gas can be stored in the Bunola pool by the fall of 1954, with a corresponding deliverability into its overall system of approximately 80 MMcf daily.

Distributor Appointed

Middle West Coating & Supply, Tulsa, has been appointed as distributor by Tapecoat Co., Evanston, Ill., enabling Middle West to offer from one source, a complete supply of products and equipment for corrosion mitigation.

Tapecoat, available in widths from 2 to 24 in., is used extensively by gas utility companies as a protection for pipe joints. Its flexibility makes it especially adaptable to sharp bends and joints.

COMPARE
YOUR PRESENT PIPE LINE WRAPPING MATERIAL WITH
NICOLET* ASBESTOS PIPE LINE FELT

How does your present wrapping material answer these questions?

QUESTION:	YOUR PRESENT MATERIAL:	NICOLET* ASBESTOS PIPE LINE FELT:
Of what material is it made?		High quality Canadian chrysotile asbestos fibers.
How long has this type material been in use?		For almost 30 years.
Are data covering long time testing of this material available?		Yes, by the American Gas Assn., the National Bureau of Standards, and the A.P.I. tests in 1930.
Is it a positive shield against soil stress?		Yes. It is at the outside, partially imbedded, and at the point where needed.
Does it reinforce the enamel?		Yes. Its strong fibers lend needed reinforcement.
Does it tighten coating to the pipe?		Yes. It is a strong, thick sheath of asbestos in solid roll lengths.
Is it moisture resistant?		Yes. Tar saturant is moisture resistant. Asbestos fibers are solid, not tubular or hollow.
Does it have high fiber count?		Yes. A natural characteristic.
Is it uniform?		Yes.
Does it have high impact resistance?		Yes.
Does it apply easily and evenly?		Yes. Accurate mat make-up gives precision laps.
Does it prevent backfill damage?		Yes.
Does it prevent lowering-in damage?		Yes.
Does it give an even thickness of enamel on top, bottom and side of pipe?		Yes.
Is it a protection for the coating beneath it?		Yes. It stops damage at the outside—before it starts.
Does it prevent damage from abrasive movement coating receives in shipping or handling?		Yes.
Does it stick in the rolls?		No.
Does it have high tensile strength?		Yes. Lengthwise—44 to 52 lbs.; Sidewise—15 to 21 lbs.
Does it relieve gas bubbles?		Yes. By compressing action.
Is it chemically resistant?		Yes. Both asbestos and tar are very inert to most corrosive forces.
Can holiday detectors be run freely over its surface?		Yes.
Can it take rough ,abusive handling?		Yes.
Does it irritate workmen?		No.
Is it a foreign material in the enamel?		No.

*Formerly GAMA

Manufactured by:

NICOLET INDUSTRIES, INC.
(Formerly GAMA INDUSTRIES, INC.)
70 Pine Street New York 5, N. Y.

Distributed by:

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207-A Daniel Bldg. Tulsa, Okla. Ph. 2-5215
P. O. Box 153 or 2-5216

PIPELINE PRODUCTS

Hydraulic Crane

CRESCENT HYDRAULIC CRANE CO., 3369 Cherry Ave., Long Beach 7, Calif.

MODEL: Hydraulic boom crane.

APPLICATION: Designed for lifting and transportation problems, this crane, with extensions, can be used for pouring concrete, setting poles, sectional building, etc. Special pieces of equipment may be engineered for particular loading or erection problems.

DESCRIPTION: Manufactured in 1½-, 3-, 5-, 10-, and 20-ton capacities, this crane can be mounted on any vehicle. Outstanding feature is its structural design, with arms rising from each side of the vehicle in a wishbone formation, thus leaving the truck bed free to carry its own load, in addition to loading onto other trucks, trailers, or platforms. Operation of the crane is fully hydraulic; a single lever is pressed in the direction in which it is to travel. The winch control is an independent mechanism and raises or lowers the load to whatever position is desired. Thus, one man can load or unload his own vehicle.

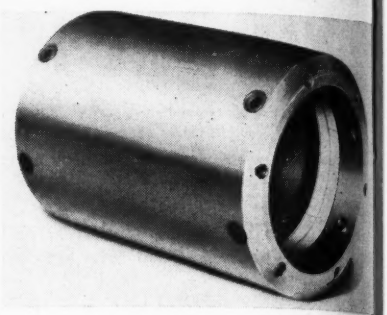
Pipeline Coupling

THE E. H. WACHS CO., 1526 N. Dayton St., Chicago 22.

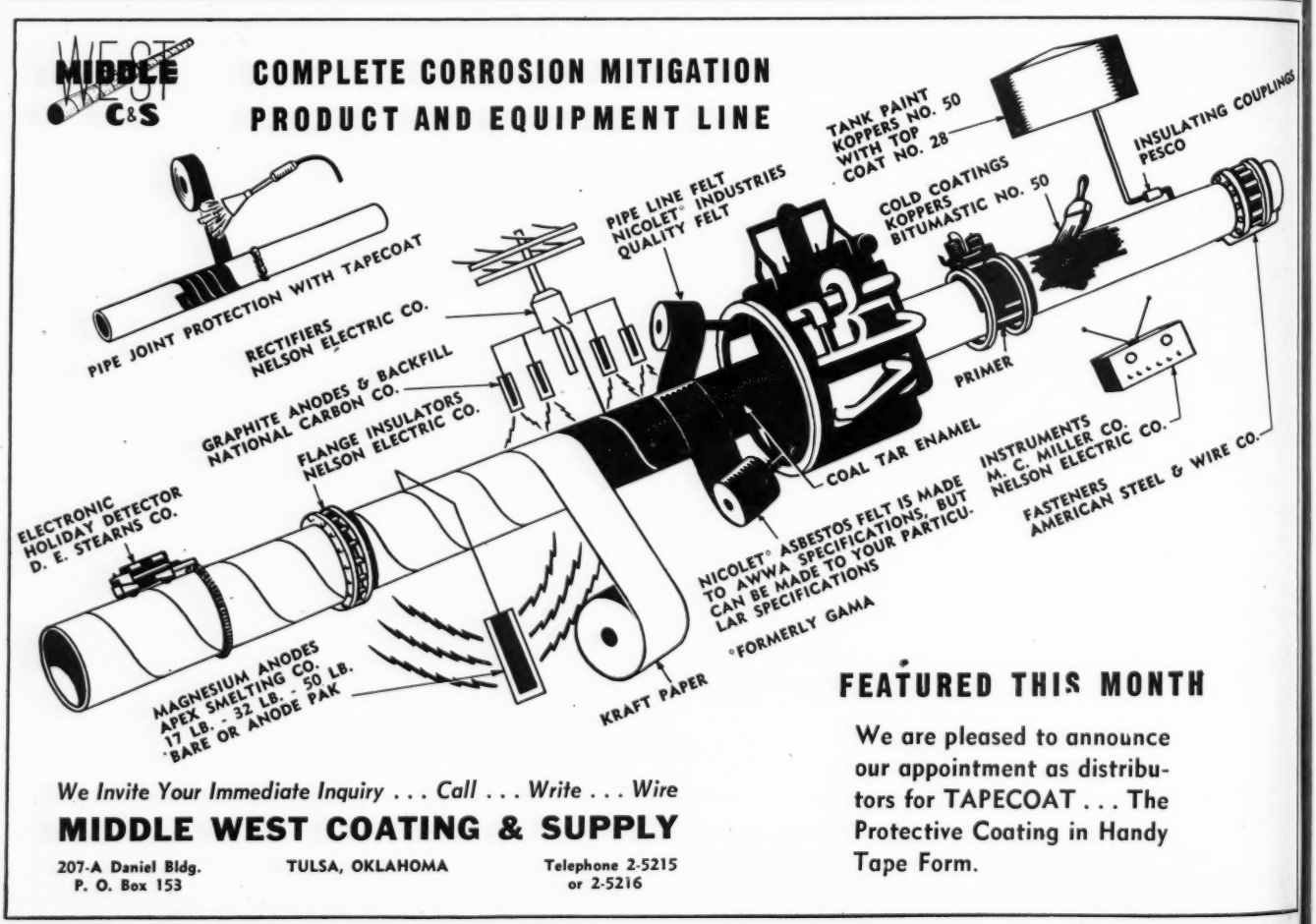
MODEL: Weld+Ends coupling.

APPLICATION: For quick, safe, economical rejoining of gas, LP-Gas, crude oil, and gasoline pipelines. Special design and construction permit effective sealing of 2- to 36-in. pipe in a matter of minutes.

DESCRIPTION: This coupling makes it possible to rejoin high pressure steel pipe-



lines under hazardous conditions, using a mechanical seal with neoprene rings instead of a torch. Full line pressure can be restored immediately and welding done after the line is back in service. The coupling is designed to withstand pressure of 1200 psi indefinitely when set manually and much higher pressures after welding.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RECTIFIERS NELSON ELECTRIC CO.
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COAL TAR ENAMEL
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FASTENERS AMERICAN STEEL & WIRE CO.
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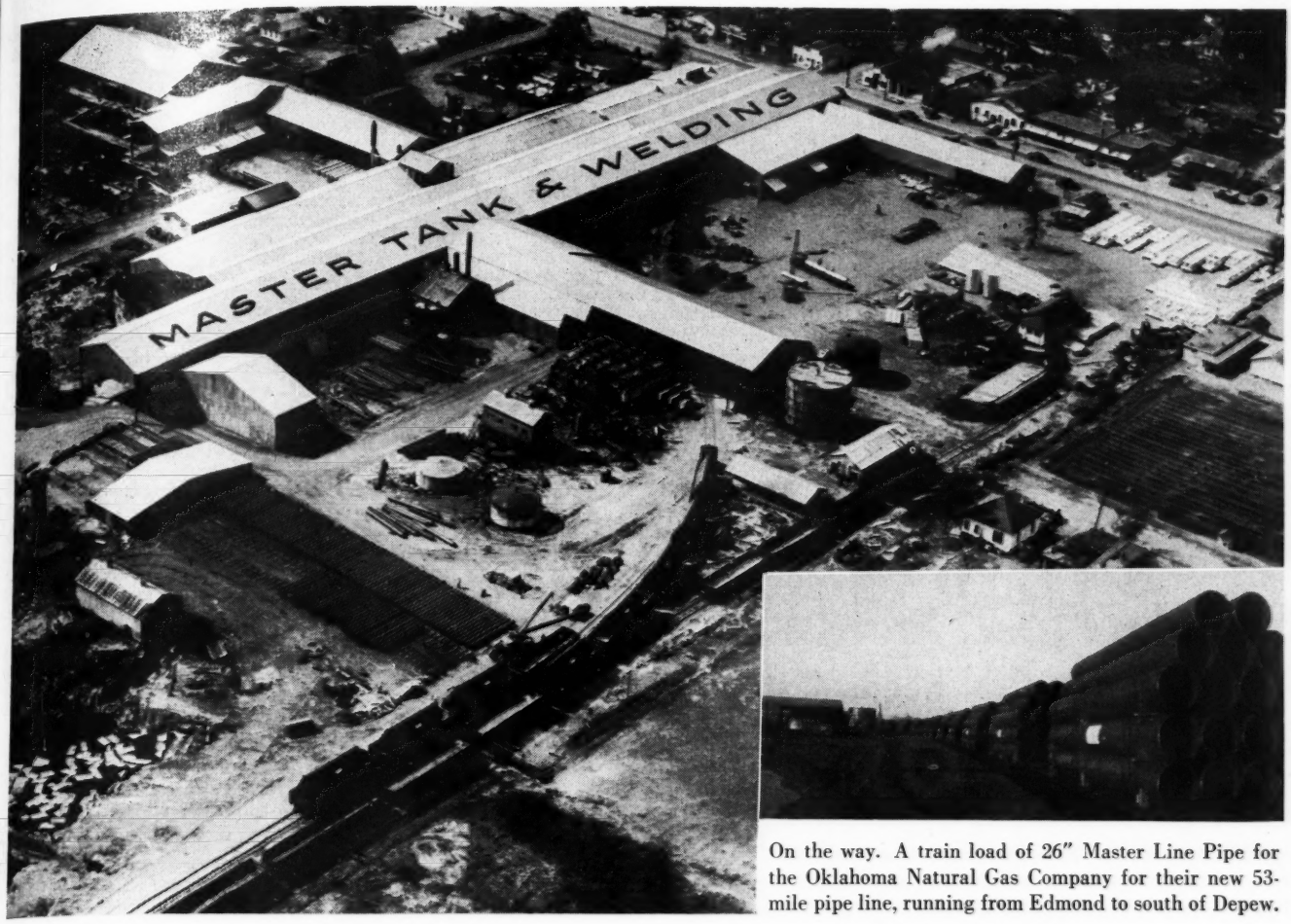

On the way. A train load of 26" Master Line Pipe for the Oklahoma Natural Gas Company for their new 53-mile pipe line, running from Edmond to south of Depew.

36 ACRES of Line Pipe Production

Can we assist you?

Line pipe construction is big business and Master Tank and Welding has the facilities and experienced personnel to manufacture Hi-Test API 5LX Expanded Line Pipe. Limited tonnage available. Let us book your requirements.

Call, wire, or write us your specifications. Our sizes range from 20" through 30" in sections 30' to 31½' long.

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MASTER GAS SYSTEM — MFG. BY MASTER TANK & WELDING

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PROGRESS REPORTS

Planned

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

ATLANTIC GULF GAS CO., 1731 miles, Alabama to Florida, Georgia, South Carolina.

ATLANTIC SEABOARD CORP., Charleston, W. Va., for a 3520-hp station in Randolph county on its Cobb-Rockville line.

CAROLINA NATURAL GAS CORP., Charlotte, N. C., 185 miles, 4 lines, from Transcontinental Gas Pipe Line Corp. main line to North and South Carolina communities.

CENTRAL KENTUCKY NATURAL GAS CO., Charleston, for 12.8 miles 20-in. loop northeast from North Means, Ky.

CITIES SERVICE GAS CO., Oklahoma City, for 56 miles of 16-, 10-, and 3-in. line in Kansas and 13,080 hp at new and old stations.

CITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.,** subsidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

CONSUMERS GAS CO., Toronto, Can., 85 miles, Buffalo to Toronto.

EAST OHIO GAS CO., Cleveland, 65-mile, 26-in. line from near Petersburg, Ohio, to Cleveland, Ohio.

GEORGIA NATURAL GAS CO., Albany, Ga., Phenix City, Ala., to Tallahassee with laterals and branches, $5.1 million.

GULF-MICHIGAN GAS TRANSMISSION CORP., St. Louis, for 680-mile, 30-in. line from Perryville, La. to St. John, Ind. with three compressor stations totaling 30,800 hp.

LYNCHBURG (VA.) GAS CO., 15-mile line from Transco's line in Appomatox county, Va., to Lynchburg.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh, for 172 miles of 16-, 20-, and 24-in. line, together with river crossings and measuring stations, from Gallagher township, Clinton county, to Cannonsburg, Pa.

MICHIGAN CONSOLIDATED GAS CO., 180-mile, 24-in. line paralleling present line from storage fields at Austin, Mich. to Detroit.

MICHIGAN GAS STORAGE CO., Jackson, for 78 miles of 16-, 22-, and 24-in. line from Laingsburg Junction to near Pontiac-Mt. Clemens, 3 laterals, 7400 hp, and 30 miles 26-in. loop. All for development of the Riverside storage field.

MISSISSIPPI RIVER FUEL CORP., St. Louis, for a 98-mile, 16- and 18-in. feeder line from Lincoln parish, La. to Woodlawn, Texas, gas field. Also 11-mile, 10-in. lateral to Waskom field, Texas.

MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo., 60 miles 6-in. from near Hannibal, Mo. to Macon.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, interconnecting lines between facilities to be acquired from 3 companies in Montana and Wyoming. Compressor station with two 330-hp units and dehydration facilities.

NATIONAL UTILITIES CO. OF MICHIGAN, Coldwater, Mich., 77 miles in south central Michigan.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Las Vegas, Nev. Includes a 4-in. branch starting 4½ miles west of Boulder City and a 2½-in. branch from 2½ miles west of Needles into the city. To be finished early as possible in 1951.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NEW YORK STATE NATURAL GAS CORP., for a 77-mile, 20-in. line from Lawrence county, Pa. to the South Bend storage area, 17 miles of field lines, and a 12,000-hp station. 82 miles 20-in. Utica to Ithaca, N. Y. and 85 miles 16-in. Utica to Albany; 37 miles 20-in. Boom storage field toward Ithaca; 23 miles 20-in. Potter county, Pa. to Angelica, N. Y.; 4½ miles 20-in. in South Bend storage field; 4 miles 20-in. Murrysville to Tonkin station, Pa.; 11½ miles 20-in. and 12 miles 16-in. Colvin Gate to Preston station, Pa.

NIAGARA MOHAWK POWER CORP., Syracuse. Stub laterals and loop to serve Albany, Utica, and vicinities include 45 miles of 6- to 16-in.

NORTHERN INDIANA FUEL & LIGHT CO., Auburn, Ind., 31-mile, 8⅝-in. line to carry gas to northeastern Indiana. Cost: $511,315.

NORTHERN NATURAL GAS CO., Omaha, plans 222 miles of additions in Texas, Okla., Kan., Neb., and Minn., and 84,000 hp additions.

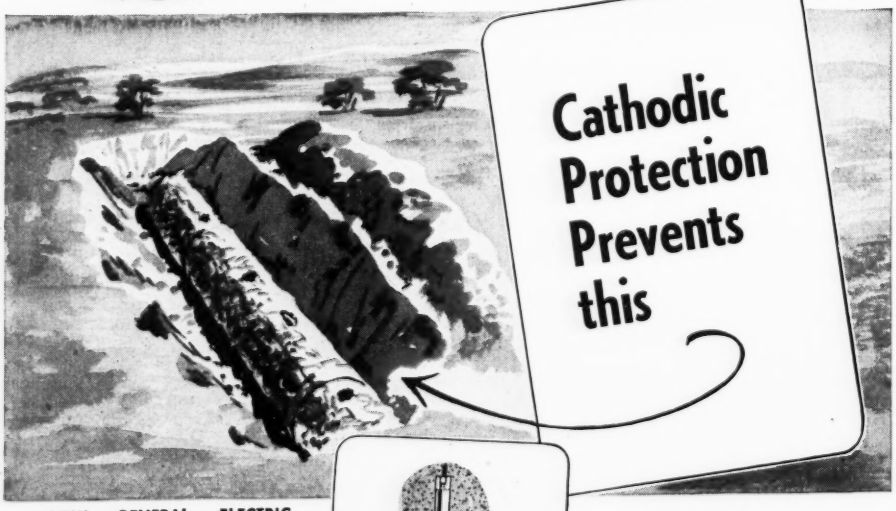
NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

OHIO FUEL GAS CO., Columbus, for 74 miles storage project lines, 47½ miles 20-in. from proposed storage areas to markets, and 10,780 hp for storage service. In Ashland, Hocking, and Knox counties, Ohio. Also 61.3 miles in Sandusky, Elyria and Dayton areas.

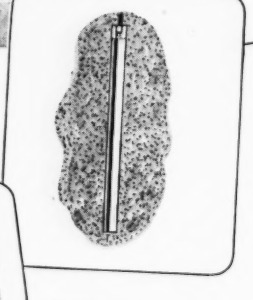
Whoooooo ...

needs Cathodic Protection?

Yooooooo!



Cathodic Protection Prevents this



NEW GENERAL ELECTRIC Cathodic Protection rectifier unit for Cathodic Protection service.
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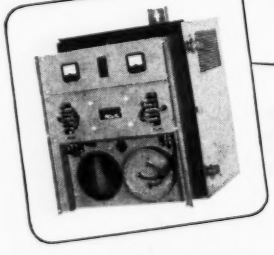

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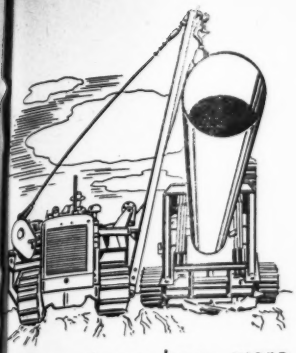
Cathodic Protection Division



Photos shown here were made during recent laying of a 26-inch natural gas pipe line by Trojan Construction Company.

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CONSTRUCTION COMPANY, INC.

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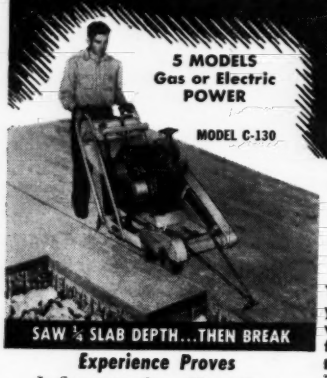

SAW ¼ SLAB DEPTH...THEN BREAK

- PATCHES
- TRENCHES
- CONTRACTION JOINTS

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Hold down COSTS and PIPE LINES with UNIVERSAL CONCRETE RIVER WEIGHTS

Hold down that line with Universal River Weights (reinforced concrete clamps) whenever you cross any body of water. Two half-rounds sections clamp around pipe. No "buoying-up" or shifting with current. No rusting. Compare products and prices before you plan to lay any line. Write for literature.

Universal CONCRETE PIPE CO. 297 S. High Street, Columbus, O.

Plants in: Decatur & Dothan, Ala., Tampa & Ocala, Fla., Atlanta, Ga., Kenvil, N. J., Binghamton, Port Washington, Rochester & Syracuse, N. Y., Columbus & Zanesville, O., Norristown & Pittsburgh, Pa., Nashville, Tenn., Clarksburg & New Martinsville, W. Va.

PACIFIC GAS & ELECTRIC CO., San Francisco, to build 141 miles of 34-in. line on existing Topock-Milpitas line and 22,780 hp compressor capacity to be added at authorized stations.

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PENNSYLVANIA GAS CO., Warren, 52-mile 12¾-in. line from Warren to Erie, Pa. and 5 new compressor units.

PUBLIC SERVICE CO. OF COLORADO, pipeline from the Piceance Creek field in western Colorado to Grand Junction and Rifle.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, 168 miles of laterals connecting with Transcontinental main line in North and South Carolina.

SHENANDOAH GAS CO., Lynchburg, Va., for 59 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTH ATLANTIC PIPE-LINES INC., Jacksonville, Fla., 254-mile line in Florida and 50 miles of laterals.

SOUTH CENTRAL ALABAMA NATURAL GAS CO. INC., 150-mile pipeline from a connection with Southern Natural's line in Elmore county.

SOUTH GEORGIA GAS CO., Atlanta, for 527 miles from northern Georgia into Florida to serve new markets in the two states.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.**, Los Angeles, on their 20- and 22-in. loop line from the Goleta dry gas field to L. A. SoCounties will complete its section in 1951 with a line from near Summerland to Goleta. SoCal will build a 21-mile loop from the Santa Clara river to the Simi tie-in.

SOUTHWESTERN VIRGINIA GAS TRANSMISSION CO., Martinsville, 17-mile line from Transcon's line near N. C.-Va. state line to Martinsville.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas & New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river. To serve Manufacturers Light & Heat Co.: 25 miles 26-in. loop and 2000 hp along its Buffalo extension. To up capacity and develop a storage project: 438 miles of loop on New England & Buffalo extensions; 44,000 hp in existing or authorized stations, 14,000 hp in a new station. To serve Iroquois Gas, United Natural, and Equitable Gas: 253 miles loop; 61,000 hp; 100 miles miscellaneous lines.

Also a joint project with United Natural Gas Co., Oil City, Pa. for 89,530 ft of pipeline and appurtenant facilities to develop underground storage area in Potter county, Pa.

TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 642 miles main and loop in La., Ark., Miss., Tenn., and Ky. Includes 189-mile line from Acadia parish to Morehouse parish, La. (24- and 26-in.) and 425 miles 26-in. loops. Also 5280 hp near Madison, Ind.; 9340 hp at 4 existing stations; underwater crossings of Ohio & Mississippi.

TRANS-CANADA PIPE LINES LTD., for a 2200-mile line from Alberta to major cities as far east as Montreal.

UNITED GAS PIPE LINE CO., Shreveport, for 50 miles in Ala. and Fla.

UNITED NATURAL GAS CO., Oil City, Pa. for 10 miles new line and to replace and relocate 10 miles all in Elk, McKean, Venango, and Mercer counties. Add 150-hp units at Hickory and

Pinegrove stations and a generator at Knox station.

UTAH NATURAL GAS CO. to build a 360-mile line from the San Juan basin to Salt Lake City. A secondary line would run from Last Chance field (Wayne county, Utah) through Sevier and Sanpete counties.

UTAH PIPE LINE CO., Dallas, for a 392-mile line from Aztec, N. M. to Salt Lake City. Includes 374 miles of 22-in. and 18 miles of 16-in.

VALLEY GAS PIPE LINE CO. INC., Houston, $144.5 million, 1000 miles of 30-in., from Hardin county, Texas, to southern Michigan, plus 500 miles of 24-in. in Texas and Louisiana, plus laterals, two 13,500-hp compressor stations, plus others aggregating 70,000 hp. Completion is scheduled for April 1, 1952.

WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B. C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring stations.

Approved

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. Includes 253 miles of main line and 279 miles of laterals.

CITIES OF BOONEVILLE, RIPLEY, BALDWYN, Miss., to connect with Tennessee main line in Benton county, 16 miles of 6-in., 23 more miles, 11-mile tap.

CITY OF TRINIDAD, COLO., a 35-mile, 8⅝-in. line from Colorado Interstate's facilities to a distribution system to be built in Trinidad.

EQUITABLE GAS CO., Pittsburgh, compressor station in Washington county, Pa. including 3300 hp, glycol dehydration plant, scrubbers, etc.

INTERSTATE POWER CO., Dubuque, Iowa. 26½-mile 8⅝-in. line to the Clinton, Iowa area. Includes a submarine crossing of the Rock river and a double submarine crossing of the Mississippi.

LAKE SHORE PIPE LINE CO., Cleveland, Ohio, 45-mile, 10¾-in. line from Meadville, Pa. to Ashtabula, Ohio.

MISSISSIPPI RIVER FUEL CORP. for 4 miles 12-in. line and not more than 7 gas wells to test storage possibilities of Waterloo (Ill.) oil field.

NIAGARA MOHAWK POWER CORP., Syracuse, 55-mile, 10¾-in. line to supply Watertown and other communities.

NORTHEASTERN GAS TRANSMISSION CO., Boston, 400 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass. to Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in. from Pittsfield to Wakefield, Mass. to be built by Oklahoma Contracting Co.; 100 miles 16-in. from Greenwich, Conn. to Springfield, Mass. to be started Aug. 1 by Britton Contracting Co. Inc.; and 225 miles 3- to 12-in. laterals, and 35 meter stations, all to be constructed in 1951.

PIEDMONT NATURAL GAS CO. INC., Spartanburg, S. C., six laterals totaling 74 miles from Transcontinental main line to North and South Carolina cities.

SOUTHERN NATURAL GAS CO., Birmingham, 3½ miles of 24-in. loop on its main line in Carroll county, Ga. and 700 hp at its Tarrant compressor station.

TEXAS GAS TRANSMISSION CORP., to develop the Alford storage field near Petersburg, Ind., a 12-mile line, 4½ miles field lines, a 1200-hp storage field station.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston, 17 miles 30- and 10¾-in. from Bergen county, N. J. to Paterson, N. J. and an 11-mile line from East Carteret, N. J. to Brooklyn. Also 45,675 hp in compressor capacity at existing stations and 41 sales meter stations.

with TAPECOAT*..

Pipe Joints Get the Same Coal Tar Protection as the Rest of the Line

Don't let pipe joints be the "weak links" in the protection of your lines!

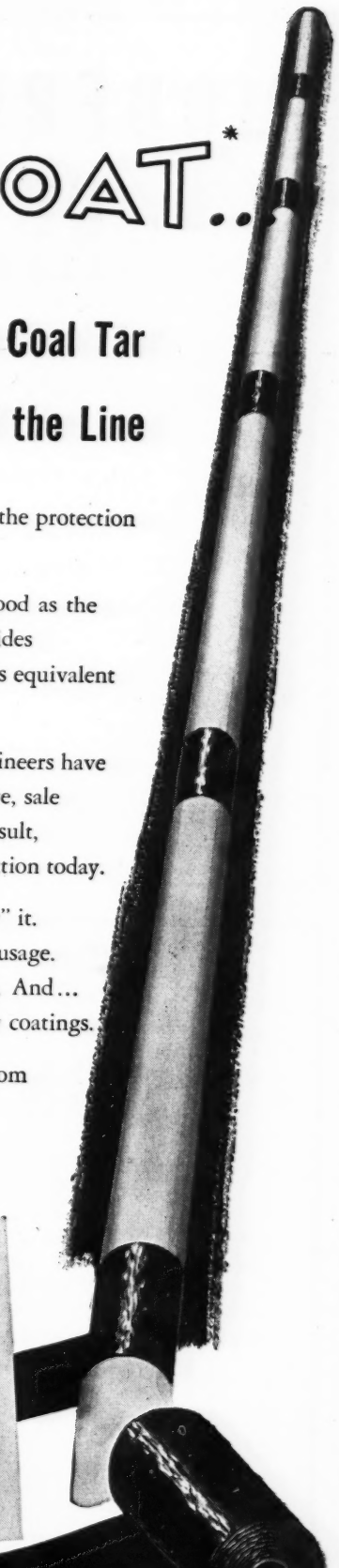
Because protection of the line is only as good as the protection at the joints, TAPECOAT provides a coal tar joint coating in tape form which is equivalent to the mill coating on the pipe.

During the past ten years, TAPECOAT engineers have devoted their entire time to the manufacture, sale and improvement of joint coatings. As a result, TAPECOAT is the leading pipe joint protection today.

It's a tough coating. You don't have to "baby" it.
It's abrasion-resisting—stands up in rough usage.
It's easy to apply with the flash of a torch. And...
Its applied cost is actually less than ordinary coatings.

TAPECOAT comes in sizes to fit the job—from 2-inch to 24-inch widths.

Write for full details and prices.



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TAPECOAT engineers will be glad to assist you on your corrosion problems.

The TAPECOAT* Company

*Reg. U. S. Pat. Off.

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Under Way

CITY OF FLORENCE, ALA. has Modern Welding Co. Inc., Owensboro, Ky., at work on 84 miles of 1- to 8-in. city system and 50 miles service lines, 2 regulator stations.

COLORADO INTERSTATE GAS CO., Colorado Springs, a 215-mile, 20-in. line from the Texas Panhandle to Colorado.

EL PASO NATURAL GAS CO., to increase deliveries to Phoenix, Ariz., 31 miles 16- and 10-in.; 11.5 miles 4½-in.; 5.5 miles 12¾-in.; six metering and regulating stations. To increase system capacity by 400 MMcf, 93 miles 26 & 30-in. loop between Permian basin & Ariz.-Calif. state line; 180,850 hp in new & existing stations; 311 miles in its field system; 42,370 hp in field stations, and appurtenant facilities.

HOPE NATURAL GAS CO., Clarksburg, W. Va., has Pipe Line Construction & Drilling Co. working on 34 miles of 8-, 10-, and 12-in. line from Fairmont, W. Va. to Terra Alta, W. Va.

HUGOTON PRODUCTION CO. has Reese Bros. Construction Co., Hugoton, Kan. at work on a 40-mile, 4- to 20-in. gathering system near Ulysses, Kan.

KANSAS NEBRASKA NATURAL GAS CO. INC., Hastings, Neb., has Cheek Construction Co. installing 10½ miles of 12¾-in. from south of Holdrege, Neb., extending southeast along an existing line, replacing 8⅝-in. Jayhawk Construction Co. taking up and salvaging 32 miles 8⅝-in. from six miles northeast of Palco, Kan., to near Stockton, Kan., and then to a point north of Glade, Kan. Engineers Limited Pipeline Co. working on submerged crossings of the Saline, South Solomon, and North Solomon rivers in Kansas and the Loup and Cedar rivers in Nebraska.

NEW YORK STATE NATURAL GAS CORP., New York, 164 miles of 16-in. from Dryden to Albany, N. Y.; 56-mile line from Dryden terminus to a storage pool in Tioga county, Pa.; facilities for a new storage pool. Also 44½ miles of 16- and 18-in. to connect the Leidy gas field with its system in Penn. Williams Austin Co., Pittsburgh, is at work on 4½ miles 20-in. in South Bend storage field area; will build 37 miles from there to Ithaca and 23 miles to Angelica, N. Y. Also 82½ miles 20-in. from Utica to Ithaca and 85 miles 16-in. from Utica to Albany. These projects will be completed during 1951.

NIAGARA MOHAWK POWER CORP., Syracuse, Williams-Austin Co., Pittsburgh, is at work on 40 miles of 10-, 12-, and 16-in. laterals and will build 55 miles of 10-in. from Fulton to Watertown, N. Y. as soon as pipe is delivered.

OKLAHOMA NATURAL GAS CO. has Tulsa Pipe Coating at work on 40 miles 16-in. from County Line to Ninnekah, Okla.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, has Conyes Construction Co. at work on 129 miles 30-in. Ill.-Ind. loop line; Anderson Bros. Inc. on 43 miles 26-in. loop in Mich.; Midwestern Constructors 10% complete on 3 compressor station additions. Knupp Construction Co. Inc. working on 16 miles of 4-in., vicinity of Liberal, Kan.

TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass. line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals. H. C. Price Co. is building 156 miles of 24-in. line from Hamburg, N. Y. to the Onondaga-Madison county line. Houston Contracting Co. is at work on 158 miles of 30-in. line from Jones, La. to Cypress, Texas.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 476 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connellsville, Pa.; seven compressor stations with 46,400 hp on new line, six with 52,500 hp on existing line; short lines in New York area. Williams Brothers-Davis Co. is at work on 163.6 miles of

30-in. line from Kosciusko, Miss., to the Tennessee river. Mahoney Contracting Co. at work on 35 miles of 30-in. from Fayette county, Pa., to Westmoreland county, Pa.

TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, on its 1331-mile line, Midwestern Constructors Inc., 100 miles of 30-in. from Mississippi river near Chester, Ill. to St. Elmo, Ill. 22% completed; crossing of the Illinois river near Morris, Ill. 90% completed. Bechtel Corp. under way on 106 miles 30-in. from Texas-Ark. line to Malvern, Ark., 34% complete; and 74 miles 30-in. from Newport to Moark, Ark., 90% complete. Fish Constructors Inc., Houston, is building compressor stations. H. C. Price Co. at work on 98 miles of 30-in. from Urbana to Garrison, Texas, 2% completed.

TRUNKLINE GAS CO., Houston, has Anderson Bros. Corp., also of Houston, at work on 180 miles, 26-in., Darnell to Senatobia, Miss., and 217 miles 24-in. Longville to Garwood, Texas. Parkhill Truck Co. stringing above jobs. On 740-mile, Louisiana-to-Illinois line, R. H. Fulton, Lubbock, Texas, is working on 278 miles of 12- and 20-in. and 184 miles of 26-in. Mahoney Contracting Co. under way on 186 miles of 26-in. 50% completed. Four major river crossings to be made under Mississippi, Ohio, Washita, and Red rivers. Anderson Bros. have contract for the first, J. Ray McDermott & Co. for the other three. Project will include six other river crossings for which contracts are not let.

UNION GAS CO OF CANADA, LTD. Shaw Construction Co., Sarnia, Ont., building a 16-in. line extending 61 miles from Windsor, Ont., to Dawn township. Includes dual crossings of the Thames and Sydenham rivers. 10 miles completed.

UNION GAS & ELECTRIC CO., Bloomington, Ill. has J. L. Cox & Son at work on 32 miles of 8-in. from Bloomington to Farmer City.

UNITED FUEL GAS CO., Charleston, W. Va., 5.5 miles, 6540-hp compressor stations to deliver gas to storage pools in West Virginia.

UNITED GAS PIPE LINE CO., Shreveport, 1005 miles in Texas, Louisiana, and Mississippi. Includes 451 miles 30-in., 6 miles 26-in., 53 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30, 26, 24, and 20-in. from Gulf of Mexico northeast to Jackson, Miss.; 215 miles from this line to near Kosciusko, Miss.; 24 miles 8, 12, and 16-in. in south Louisiana; 16 miles of 16-in. from Koran gasoline plant site, La., to its Carthage-Sterlington line in Louisiana; 4000-hp compressor, dehydration plant. Contracts have been awarded to Brown & Root Inc., Houston, for engineering, construction, and other services and to Gulf-Southern Contractors, Fort Worth, for other major work on the project. In offshore fields in Gulf of Mexico: 12.3 miles 14-in. line. Texas-Louisiana Contractors building 52 miles 20-in. line from Magnet-Withers to Freeport, Texas. Nine miles completed. H. C. Price Co. has signed a contract for the Somastic coating of 157 miles of line to be laid in south central Louisiana.

Contracts Let

KANSAS-NEBRASKA NATURAL GAS CO. INC., Hastings, Neb., to Cheek Construction Co. Inc. for (1) 22½ miles of 12¾-in. line from a point near Holcomb, Kan. northeast and north toward Scott City; (2) 16 miles of 12¾-in., starting east of Wakeeney, Kan., and extending northeast paralleling the company's line from Scott City station to the Palco station; (3) 34½ miles of 12¾-in. from 6 miles northeast of Palco to near Phillipsburg, Kan., replacing the 8⅝-in. line paralleling an existing 12-in. line running northeast and north from Palco station. Jayhawk Construction Co. Inc. has contracts for 40 miles of 6⅝-in. line starting at Albion, Neb., extending northeast to Norfolk, Neb. and will install 26½ miles of 6⅝-in. line between Albion and Neligh, Neb.

OHIO FUEL GAS CO., Columbus, to Somerville Construction Co., Ada, Mich. for 20 miles of 20-in. from New Albany to Homer, Ohio. To be completed about May 20.

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Advantages Essential for a Thorough Pipeline Cleaning Program—12-Inch Through 30-Inch

(Also 6″, 8″ and 10″ Available Soon)

EXPANSIBLE

Will not get stuck in heavy walled crossings. Constant pressure by brushes against the entire circumference, top, sides and bottom. Expands to compensate for brush wear. Tight fit at all times insures a perfect cleaning job.

VARIABLE

Brushes (or working surfaces) are double that of other cleaners—brushes can be interchanged to meet any condition — fine, medium or coarse wire brushes — also steel scrapers. Fits any job.

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A welding rod bursts into bright flame as a student at H. C. Price Co. welding school strikes an arc on a section of 24-in. pipe.

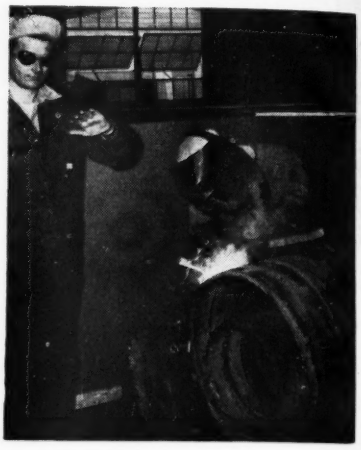
Intensive Welding Course Trains Price Crews

Ten men from each of H. C. Price Co.'s four construction spreads have been getting a chance to learn the complicated techniques of pipeline welding in an extensive course of instruction at Bartlesville, Okla.

The first group of students, from spreads three and four, started their intruction early in February. A second group of 20 men, from spreads one and two, began the course on March 19. Both groups will continue in session until all personnel has passed rigid field tests. Each student is given 30 hours of closely supervised instruction a week, with a curricula geared to qualify him as a regular line welder.

The students are taught the terminology of pipeline welding, then shown the various methods of welding, followed by instruction in the different pieces of equipment used by the trade. They first practice on flat plates, then start welding cuts of small pipe, gradually moving up to larger diameter pipe. These men learn to tack weld as well as "run" filler and cover beads.

In charge of the welding school is John Stokes, stringer bead welder from spread two, who is assisted by Vic Cook, spread three, and E. C. Lewis, spread two.



John Stokes, supervisor at the Price school, observes the work of Cassel Williams, who is about to complete a practice weld.

George Simpson (facing camera) and Forest Reutzel are shown practicing with a cutting and beveling machine.

These booths provide space for all-weather welding instruction and, although Jack Lytle and Cecil Bolton are the only students visible, there are actually ten men working in the stalls.

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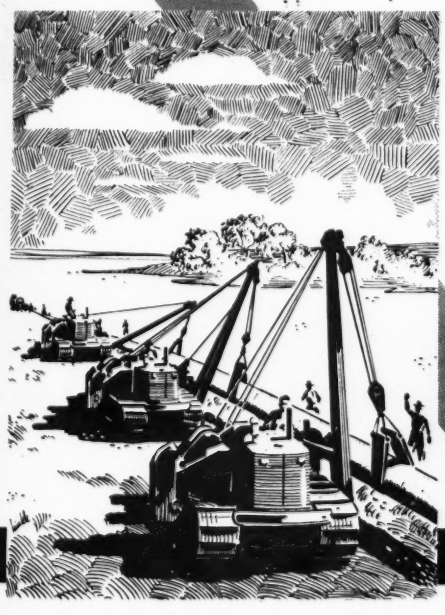

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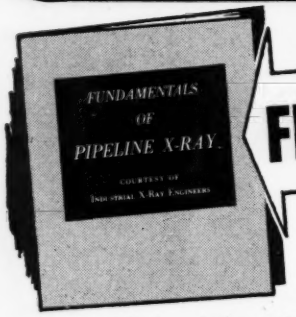

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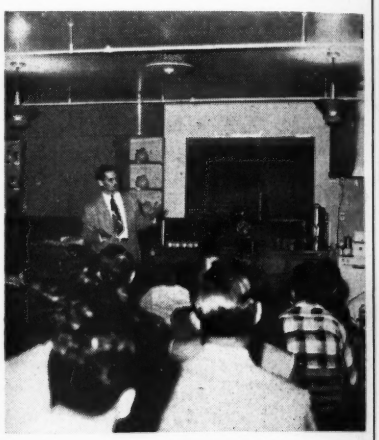
Pipeline Newsnotes

Construction of a commercial, gasoline-from-coal synthesis plant in South Africa will be started soon by M. W. Kellogg Co., New York. The plant, about 40 miles south of Johannesburg, will be built for the South African Coal, Oil & Gas Corp. Ltd. The project includes opening virgin coal deposits, constructing aboveground gasification facilities, and building the synthesis plant, which will employ Kellogg's Synthol process.

Wabash Natural Gas Co., Carmi, Ill., has received FPC authorization to build a ½-mile, 4-in. line to transport gas for distribution by Consumers Gas Co. in Carmi. The $15,000 line will connect with Texas Eastern Transmission Co.'s line, which will furnish up to 500 Mcf daily to Consumers on an emergency basis.

An amine treating plant near Dumas, Texas, recently was completed for Canadian River Gas Co. by the chemical plants division of Blaw-Knox Co., Pittsburgh. Completed within a record five weeks, this plant removes sulphur from "sour" natural gas to improve the fuel's value and to decrease corrosion in transmission lines.

Natural gas at 20,300 ft blew drilling mud over the derrick at No. 1 Tung Oil Corp., three miles northeast of Wiggins, Miss., last month. Pressure was estimated at more than 10,000 psi, and the well may be claimed as the deepest producer in the world.

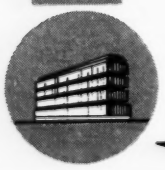


Earle Pitt, Foxboro Co., is shown explaining the mechanics and fundamentals of orifice meters at a meeting of the new Ark-La-Tex Measurement Society, which claims to be the first organization of its kind in America.

Since its initial meeting last December, the membership has grown to include more than 140 persons representing oil, gas, and supply firms.

President of Ark-La-Tex is J. P. Knause, United Gas Pipe Line Co., Shreveport. Other officers, all from Shreveport, are Ralph Worley, Parade Co., vice president; Walter A. Stewart, Arkansas Natural Gas Co., treasurer; and Bruce Caldwell, Texas Eastern Transmission Co., secretary.

A quick quiz on Cooling Towers



Is your cooling tower meeting design specifications . . . giving trouble-free operation?

Is it . . . free of accumulative algae . . . safe from structural failure . . . subject to accelerated deterioration?

Does it have . . . full decking in good repair . . . minimum drift loss efficiency?

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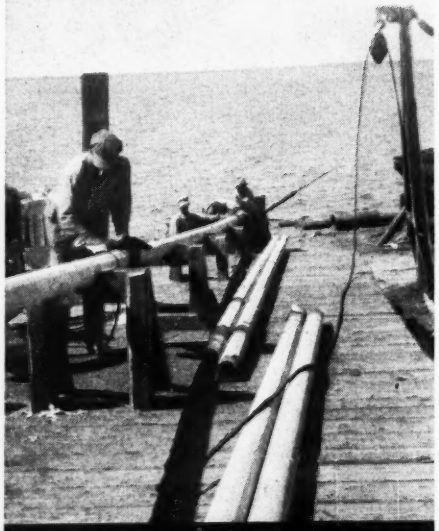

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